

PRACTICAL GUM-BICHROMATE

PHOTOGRAPHY BOOKSHELF SERIES No.20



BY J. CRUWYS RICHARDS

Herbat - A. novis



GUM BICHROMATE

BY

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I.—INTRODUCTORY.

AT the exhibition of the Photographic Salon, London, 1894, the attention of the photographic public was first drawn to a new method of printing by the photographs exhibited by Messrs. Maskell, Demachy, and Rouille Ladeveze. It was at once recognised that a new power had been put into the hands of pictorial workers, no hitherto worked process having yielded such freedom as was there displayed. So unmechanical, so fresh, and so vigorous were these pictures that no one, ignorant of the how and the wherefore, could say definitely what they were or how they were produced.

At first sight the impression given was of a water colour or chalk drawing, by the hand of a master. Skilled draughtsmen looked into them wonderingly: a pigment there was undoubtedly, and presumably tempera; but what masterly skill of delineation, almost too literal to be handwork, and yet so strongly suggestive of handwork! If photography, then indeed were quite new possibilities opened out to its practitioners. When later,

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by the courtesy of these exhibitors, the working details were revealed to the public, it was found that photography had secured another, and possibly its highest, means of expression, and one that brought it into closer kinship with the art of the pencil and brush than any other that had preceded it.

Briefly described, the gum-bichromate process, as it was then named and is still called, appeared to be a method of producing photographic pictures in a water-colour pigment, the principle of production being the well-known hardening action of a bichromate salt on glue, starch, gelatine, gum, or any other colloid substance exposed to light.

If, for instance, a sheet of paper be coated with a solution of gum and potassium bichromate, and then exposed to the action of daylight, it will be found that some portions of the gum, where the light has acted most freely, have become hardened and insoluble, even in hot water, the gum being more or less insoluble in proportion to the amount of the light's chemical action. Where the negative is densest, and consequently impervious to light, the gum remains soluble and will wash away rapidly.

Therefore, if to the solution of gum and potassium bichromate a pigment be added, and a piece of paper be coated with the mixture, and then exposed under a negative and placed in water as before, the same action will take place ; the soluble gum will wash away and with it the contained pigment, leaving on the paper the picture in the pigment-coloured insoluble gum.

The term "insoluble" is, however, to be taken comparatively, for, if we so choose, by prolonged soaking in water, the use of hot water, the abrading action of a spray or brush, etc., we may remove every trace of gum-pigment from the paper. It is, indeed, in this possibility, that the greatest value of the process lies, giving, as it does, the power to eliminate the undesirable, to suppress unimportant details, and to emphasise points of special interest ; and consequently favouring, in a unique manner, the exercise of personal taste and artistic feeling, and that in so marked a degree, that every print from one and the same negative may possess distinct individual characteristics.

That so elastic and ductile a process

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should win universal commendation was not to be supposed. A great outcry was raised by the purist as to whether these pictures bearing so close a resemblance to crayon or water-colour drawing could be legitimately termed photography. Successful workers of the process were advised to abandon the mechanical basis and to take to painting pure and simple. Ridicule and abuse were heaped on them unmercifully, probably not without reason, since many workers rushed to try the process, producing results sometimes glaringly faulty and incorrect, yet commonly and not quite unnaturally supposed to be normal specimens of the "gum process." Prophecies of a speedy decease even were freely uttered. Yet, in spite of the adverse criticism, the process survived. The beautiful work exhibited at the Photographic Salon year after year by M. Demachy was a perpetual stimulus to those who had tried and failed to get any measure of success. Certain results were easy to obtain, but the highest, as exemplified in the works of Demachy, required the utmost skill, and effort the most arduous and painstaking possible.

Highly successful pictures did, in spite of the difficulties, appear, and slowly their numbers grew, until at the present time at least twenty-five per cent. of the Salon exhibits consist of gum prints. Although these chapters are meant to be mainly a practical treatise, it will be interesting to those unacquainted with the history of the gum-bichromate process to have the main facts concisely put before them.

The honour of being the earliest worker in chromated pigment is accredited to Poitevin, who, in 1855, worked indefatigably with Hunt and Fox Talbot, in the hope of bringing about some practical results; but we have no public notice of any great progress having taken place until January, 1859, when John Pouncy read a paper before what is now the Royal Photographic Society on "A suggested printing process on paper coated with a solution of gum arabic, vegetable black, and potassium bichromate; giving exact proportions; describing the most suitable papers; and detailing in precise terms the mode of coating, exposing, and developing." There still exist some examples of Pouncy's work which show that

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he achieved much skill in the working of the process.

There were, however, others still at work and experimenting with other colloids ; and in 1864 was born the standard carbon or Swan process, which, giving as it did ease and uniformity of working, with beauty and permanency of results, practically eclipsed the earlier gum method, which lay dormant for many years. In fact, it was ignored until its revival in 1894, by Rouille Ladeveze, who, in that year, exhibited prints at the exhibition of the Photo Club de Paris, produced by coating paper with bichromated gum and pigment. His methods, when published, were found to be identical with Pouncy's.

Later in the same year his prints were exhibited at the Photographic Salon, London, joined on this occasion by those of two other workers, Robert Demachy and Alfred Maskell, who soon afterwards published in collaboration a treatise describing their methods of working, under the title of "Photo Aquatint," this being soon followed by a handbook by yet another successful worker—W. J. Warren.

In France and Germany other develop-

ments followed. It was found possible to recoat the prints with sensitive pigment, and then to re-expose and redevelop them, one pigment-image being thus superimposed on another, and a picture being in this way built up by degrees. The range of tone was thus enormously increased; good results, too, became easier to obtain, since a faulty spot or a false tone could be remedied in a subsequent printing. This method has not been so popular in France as in Germany, the French rather preferring the freshness and spontaneity of the earlier method, even though in securing it some loss of tone is suffered. But to the German the possibility of procuring an absolutely finished picture appeals with the greater strength, and he, in consequence, prefers the multiple print.

In England the older method slowly advanced in popular favour, appealing to enthusiasts in spite of, if not because of, its undoubted difficulties, each worker selecting that particular side—of this many-sided process—which best served to give expression to his own individual taste. To-day, out of the hundreds of workers, one knows a Demachy, Puyo, Moss, Blount, Page Croft,

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and others at a glance, and this, not through the artist's selection or treatment of his subject, but through his handling of the gum pigment. At this moment, in England, there is a trend towards multiple printing, which must, through its many excellences, find adherents, though no doubt the earlier method will still be employed concurrently for the sake of certain effects which it is eminently fitted to produce.

We have seen that, in the revival of the gum process by Ladeveze and others in 1894, the divergence made from the method practised by Pouncy in 1859 was but small, and even now, after a decade of working, the procedure is the same; each worker having probably a pet formula which in his hands may give better results, although in the main it is identical with that of Pouncy.

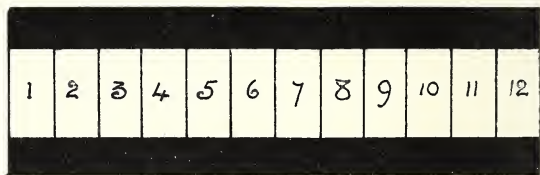
II.—THE PROCESS DETAILED.

A SHEET of paper is coated thinly with a solution of gum, pigment, and potassium bichromate. Whilst this coating must be thin if it is to work satisfactorily, it must also be borne in mind that its strength of colour is the darkest end of our scale, and we can get no greater depth of tone in our picture ; consequently, if a coating of black is applied so thinly that it appears grey, it must follow that the deepest shadows of the picture will be grey also—a result possibly very successful for delicate pictures, though somewhat lacking in vigour for general purposes.

In gum work produced by the “single” printing method there must, as a necessity, be a shorter scale of gradation as compared with other processes where the image is built up, and this in the main due to the difficulties encountered in working a sufficiently dark and thick coating of pigmented gum—difficulties so great that it is almost fortuitously in rare cases that one does succeed in getting a long range of tones.

THE PROCESS DETAILED.

Gum pictures can be and are produced that are perfect in this respect, but I strongly advise the average worker to be content with the shorter scale and some certainty of result. It will be better to assume then, for our purpose, that with the "single" gum process the scale of gradation will consist of a few of the middle tones only of our actinometer (see illustration fig. 1), not that this is by any means so disadvantageous as one



ACTINOMETER. MADE OF FAIRLY THICK TRACING PAPER
THE FIGURES DENOTE THE NUMBER OF PIECES OF PAPER
THUS NO 12 HAS TWELVE THICKNESSES AND NO 1 HAS ONE ONLY

FIG. 1.

would at first naturally suppose. Too frequently, indeed, the wealth of detail and length of scale that our negative gives us is an embarrassment; and we have to resort to the process of sunning down before any unity of composition can be obtained—a method effectual indeed, but not satisfactory, since the whole scale is by it lowered so much that general murkiness and gloom ensue.

“As in music the most beautiful melodies and harmonies are drawn from the middle octaves, so in painting the tenderest and most satisfying effects may be produced by the judicious arrangement of graduated half-tones,” and hence the limited range yielded by our single printing does not of itself prove defective, since it is likely to give us breadth and harmony of tone.

By “tone” is here understood the correct rendering in monochrome of the colour values of the various objects that make up a picture, together with the correct relationship of their light and shade—in other words, the absence of isolated masses of light or darkness standing out sharply in a detached sort of way, and thereby displaying harsh contrasts instead of gentle gradations. It has been justly said that “a good picture should have one light larger and brighter than other lights, or one mass of colour dominant over all the other masses. In proportion, as they are separated and led up to by intervening masses of graduated half-tone, the effect will be one of harmony, calm, and peace.”

The picture may possess the complete

THE PROCESS DETAILED.

scale of gradation from black to white, which we render very imperfectly on our actinometer by twelve steps, or it may prove highly satisfactory, as we have seen, with only a small section represented, say, by four or five steps.

We may commence with any part of the scale we choose, and take any number of tones in succession, and secure harmony and truth of tone. Thus, one representation of the same picture may take No. 1 as its highest light and No. 6 with its deepest shadow, or it may commence with No. 3 and finish with No. 9, or even so dark a tone as No. 6 may be the highest light if the other differences of tone follow proportionately. All these representations of the same picture may be equally correct in tone value, though differing widely in their general effect. The essential point is that these steps or tones follow on in regular sequence.

Such an omission of intermediate numbers as is involved in selecting tones 1, 2, 3, 5, or 2, 5, 7, 8, would destroy all harmony. In correctly-rendered values, these steps will never be found out of their due order, though at a first glance they may appear to be so,

particularly in the case of a strong and vigorous effect, where bright light and masses of dark are sharply contrasted.

In nature, even black and white objects, viewed from a little distance, at their point of contact, would merge into each other with a softened edge, and in this edge, though possibly compressed into the breadth of a line, the full scale of tones from black to white would be comprised. Similarly and universally in any picture embodying correct values, these successive tones should exist, sometimes broadly expanded and sometimes so compressed that the eye notes nothing but a softening of the line ; always, however, in exact sequence, whether the number of tones be two or a dozen.

Nature is never out of harmony, though photography frequently is, even with colour-corrected plates. Consequently we have to resort to dodging and compensating methods of printing in order to secure this essential quality.

Now in gum it is as easy to get false values as in any other process—nay, easier, since in it a delicate middle tone may be readily destroyed. But it is also easier in

THE PROCESS DETAILED.

it than in any other process to obtain correct values.

In the "single" printing this is attained mainly by the suppression of those details which, if allowed to develop mechanically, would enter into active competition with the principal points of interest, for though we cannot add to the length of the scale at the dark end, we can control development, and in so doing obtain the desired effect.

In the "multiple" printing we have precisely the same mastery over tone as the artist has with pencil and brush, and failure to secure harmony must therefore lie, not with the process, but with the individual, the scale being the longest possible, and limited only by the blackest pigment and the whitest paper obtainable.

The single printing has to the draughtsman all the charm and fascination of a masterly sketch, full of latent power and possibilities; for he sees in it the most skilful rendering of effects that he has found perhaps so difficult to transcribe to paper, effects bearing the closest possible resemblance to drawings produced by the manipulative dexterity of a highly-trained hand and yet

easily obtained in gum when he both knows what he seeks and when he has found it. In the "single" printing, texture, grain and choice of colour are at our will, as well as gradation, delicacy of detail, and tone within limits; for undoubtedly fresh and vigorous suggestiveness, rather than detail or full tone rendering, is the chief characteristic of the "single" print in comparison with the "multiple" print with its richness of colour and long scale of delicate gradations.

I propose, in the following chapters, to illustrate my teaching by reproductions from my own gum prints in the belief that I shall thus be able to give such complete details of the working as, I trust, will be of practical benefit to my readers. Variations and improvements will probably suggest themselves to each reader, but for the present purpose it will be better to describe exactly the process by which the various effects these prints exemplify were produced, and, to begin with, in the next chapter I will deal with all the requisite materials.

III.—THE MATERIALS.

THE first, and perhaps the most important, of our materials will be the paper; but fortunately in this direction we have much latitude, almost any sort being suitable after a preliminary sizing that will be described later. The most desirable qualities of the paper are toughness and hardness of surface, soft and somewhat absorbent paper being useless while in that state, since it is an essential condition that the layer of pigment be retained on the surface of the paper, as otherwise the print would be immediately stained. Some papers which feel hard and stiff to the touch do not always bear testing, for in the water the size dissolves out, and they then become limp and absorbent.

Whatman's water-colour paper does not work satisfactorily without preparation. A soluble size is used in its manufacture, and as this washes out in the laying on of the pigment, there is left a stain in subsequent development. Some cartridges, too, behave like this; but as a rule the cheap cartridge papers are very suitable. Writing paper and

tub-sized (a technical term) papers give a variety to choose from. At any printing works one can get samples, and then experiment until the best one for the particular purpose is ascertained. Paper that is lightly sized will result in a very fine deposit of pigment being left in the high lights, and this is often a great advantage in printing from a hard negative.

Trials should be made by coating strips of the sample papers with the sensitised pigmented solution. After one of these strips is dry it should be bent up in a sort of zigzag, exposed to light for a minute or so, and then placed in a bath of cold water. In ten minutes or thereabouts some parts of the pigment in the bends of the paper where it has been kept from the light will have dissolved away. If they have not done so entirely, but have left a deposit on these protected portions, the effect of passing a brush over these should be tried. If the colour then leaves freely, the paper is suitable for brush development and hard negatives, though for general work it would be better for more size.

I find, in making these tests, that it is

THE MATERIALS.

not sufficient to coat the paper, and dry it, and then put it into water without exposure to light. Sometimes the pigment will not leave the paper unless it has had a little light action. This will be noticed now and then in a print which will develop into a picture with the high lights pure and white, whilst the edges of the print which have been protected from light by the rebate of the frame still retain a considerable amount of pigment.

A smooth-laid paper must be avoided. It is almost impossible, even for a skilled hand, to coat this evenly with the pigment. From Messrs. Reeves and Sons, Ashwin Street, Dalston, London, the following papers may be obtained. I have tested each one and recommend them as suitable :

“No. 1 Continuous Cartridge” is a stout paper of fine grain.

“No. 3 Continuous Cartridge” is a paper with rather more grain than No. 1. It is ready for use, and I strongly recommend it.

“No. 6 Continuous Cartridge” is similar to No. 3, but somewhat thicker. It is equally suitable.

Steinbach paper has a very fine grain, and is also ready for use. It is a water-colour paper, and therefore more expensive than the cartridges.

For a rougher paper for large work I advise Double Elephant Cartridge (engineers').

Michallet is a paper with a fine parallel grain, and is well known in our schools of art. The grain gives a pleasing diffusion to large-sized pictures. It is very suitable, and the pigment leaves the paper freely.

Lalanne and Ingres are similar to the Michallet, but the parallel grain is smaller and finer.

Nearly every kind of paper may be used after a preparatory sizing, made as follows :

Gelatine	$\frac{1}{4}$ ounce
------------------	---------------------

Water	1 pint
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The gelatine is first soaked in cold water, and then dissolved in hot. The solution is allowed to stand and cool, when it takes in the form of a thin jelly. This is applied to the paper with a piece of flannel, rubbing with light pressure until no jelly is left on the surface.

Or the size, whilst it is still warm and liquid, may be applied to the paper with a

THE MATERIALS.

stiff hog-hair brush. Use plenty of size, and distribute it evenly with the badger softener. Whatman's and soft papers should have two or three sizings.

The pigments may be in dry powder or the ordinary water-colours (cake, tube, or pan), or tempera, or decorators' water-colours in tubes.

The most satisfactory are the dry powder colours, which can be obtained from a decorator's or a druggist's shop. They are cheap but somewhat coarse grained, and before use require grinding, which is easily done on a piece of ground or obscured glass. The rough surface of such glass reduces the labour nearly one-half.

A palette knife will be required; not, however, a small one as sold by an artist's colourman, but a full-sized one, obtainable at an ironmonger's; or, in its stead, may be used an old table knife with the blade worn flexible.

A small quantity of the colour is placed in the centre of the glass, a few drops of water added, and with the palette knife it is mixed to a paste, and then ground by pressing the flat side of the palette knife on the flat

glass with the colour between, grinding and grinding, with a circular motion, until the pigment is smooth and no longer grits under the knife.

Artists' colours in powder, ground fine enough to pass through a sieve with one hundred and twenty meshes to the linear inch, may be obtained from Messrs. Reeves and Sons, London. They are considerably higher in cost than the rough colour, but still are cheap enough in the blacks and reds to be used by those desiring the best possible, a quarter of a pound of black going a very long way. They are not quite fine enough for use, and will therefore require a little grinding on the glass palette.

The prices of a few of the colours are—

Lampblack	..	per $\frac{1}{4}$ lb.	1s. 6d.
Burnt sienna	..	„	1s. 6d.
Venetian red	..	„	1s. 0d.
Burnt ochre	..	„	1s. 0d.

The same colours in the rough state, to be obtained from the same firm, cost—

Lampblack	..	per 1 lb.	6d.
Burnt sienna	..	„	1s. 0d.
Venetian red	..	„	5d.
Burnt ochre	..	„	5d.

THE MATERIALS.

The artists' water-colours which are put up in tubes are ready for use. The art student's quality, as sold by Messrs. Reeves, work very well, and are cheap, though costing very much more than the powder colours. The cakes of colour should first be placed in a saucer of water and allowed to soak undisturbed for some hours. They will soften completely, and yet will not mix with the water, which should be poured off. The cake of colour may then be taken up with the palette knife and rubbed round on the glass palette to the consistency of the tube colours.

Personally, I have first preference for powder colours, and next in order for tempera or decorators' colours. The finely-ground artists' colours seem to have little or no body or substance, and I do not use them except for giving very thin coatings for "multiple" printing and for mixing occasionally with the powder colours in "single" printing.

The only tempera colours that I know are the Syntonos Decorative Colours, which may be obtained from Messrs. Southall Bros. and Barclay, Broad Street, Birmingham. They are of Bavarian manufacture, and are

excellent in every way, being finely ground (and quite ready for use), and yet having as much substance as the powder colours. I do not know of an English make of tempera colours.

The "Syntonos" are cheap, the following, which I have used, being supplied in large tubes 7in. long by $1\frac{1}{8}$ in. diameter: Raw umber No. 111, burnt umber No. 112, burnt terra verte No. 115 (a similar colour to burnt sienna in English colour), English red No. 107, vine black No. 118, and ivory black.

The beginner should make his browns for the "single" printing by the mixture of black and burnt sienna or black and Venetian red. The resulting brown will not be so pleasing as the natural brown of the umbers, but it will be far easier to work, and that is a great advantage of which the beginner will do well to avail himself.

For "multiple" printing the range of colour is extended indefinitely; almost any colour may be used, since no great depth of any is put on the paper in a single coating.

Lampblack, in its cheap form, is subject

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to much adulteration. It should be quite soft and require little or no grinding, only, in fact, just a little mixing with the knife, but more frequently than not it is found to feel like sand under the knife. That kind is of no use. It is said that the soot from an acetylene lamp makes an exceptionally fine black, mixing well with gum, and far superior to any commercially-prepared black. Vegetable black or dropblack is a good colour, and easily ground, but is not so intense as lampblack.

M. Demachy is particularly fond of rich black for gum prints, and finds nothing else works so well. Personally, I much prefer browns, even though they do not work with so much ease, as giving warmth and suggestion of life to portraiture.

If the coarser pigments are used, I should recommend that a stock of colours be kept in a semi-liquid state in small bottles. It will save much time, since all the mess and trouble of grinding is in that case done in one operation. The finely ground pigments may be kept in the dry state as purchased.

For the gum, the ordinary unsorted gum arabic in lump is best, and may be bought

from the druggist. To prepare it for use, two ounces of the gum is taken, tied in a piece of muslin or linen, and suspended in a jar containing five ounces of water, leaving it to dissolve there, and afterwards bottling and corking. By this method, which was suggested by a correspondent, all the more insoluble portions, together with the dirt and chips, are kept back in the muslin, and the gum outside is ready for use, no further straining being necessary. The gum will keep a considerable time, and no preservative need be used.

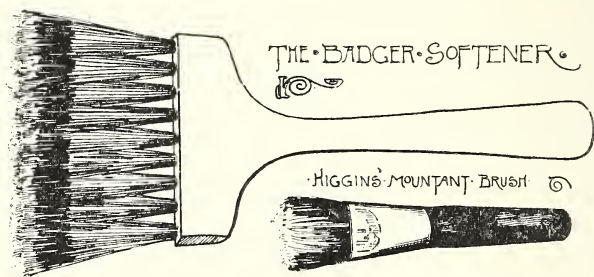
The brushes will be the next consideration. One is required for laying the pigmented gum on the paper. Bear-hair in flat tin about one inch in width, or a hog-hair mountant brush such as is sold by Higgins, answers admirably, and is the kind I have used for some time. The camel-hair brushes quickly spoil, and loose hairs come out at most ticklish moments during the process of laying. I would not advise their use.

Then a badger-hair one is wanted for softening (see illustration). It is somewhat expensive, but will last two or three generations of photographers, and can be used

THE MATERIALS.

when the hair is worn down to two inches from the bottom.

The sensitising solution is made by adding two ounces of potassium bichromate to a ten-ounce bottle of water. We can thus make certain of having a strong solution,



since some of the bichromate will, with these proportions, remain undissolved, allowing more water to be added from time to time, and as much more bichromate as may be required.

This finishes the list of materials for the "single" printing.

IV.—THE WORKING OF THE “SINGLE” PRINT.

THERE are two methods of working the “single” gum process—one in which the sensitiser, the potassium bichromate, is incorporated with the pigment and gum, and the whole applied in one operation; and the other, and more usual way, where the paper is first sensitised with the bichromate solution and dried, the pigmented gum being applied subsequently.

The latter method is the more certain, and therefore the better to begin with, and the procedure with it is as follows:

Into a fairly deep porcelain dish, large enough to take the paper to be used and leave a margin to spare, enough of the saturated bichromate solution is poured to make a depth of an inch or thereabouts. The paper is immersed in this sheet by sheet, until ten or a dozen pieces are in the solution, taking care as each one is immersed that it is freed from air-bubbles. The bottom piece of paper, *i.e.*, the first inserted, is lifted to the top, then the one underneath

to the top, and so on for two or three minutes, to ensure even saturation of the paper. The paper is then removed and hung up to dry, either in the dark or quickly before the fire; not too close, however, for fear of its drying unevenly, and of the solution condensing, and of the bichromate crystallising out. When dry, the paper is sensitive to light, and must be stored in the dark and kept dry, in which case it will remain in good condition for a considerable time. The loss of its bright yellow colour indicates that it has become unfit for use. Large sheets of paper may be sensitised by applying the bichromate freely with a sponge or mop brush, and lifting up by one corner to drain and dry.

To prepare the pigmented gum for coating, the stock solution of gum two in five and the pigment previously mixed with water to the consistency of cup custard are got ready. Five drams of gum, four drams of water, two drams of Venetian red (prepared as above) are taken, mixed well together, and strained through muslin. A small strip of paper is coated evenly and dried before the fire. If it dries rather dull and dead-

looking, a little more of the gum solution is added, but if, on the other hand, the surface is very shiny, more water is wanted. The ideal surface should have a medium glaze, neither too shiny nor too dull. When it seems right a further trial is made on a piece of the paper previously sensitised with potassium bichromate. This is exposed to light for a minute, shading some portions by bending the paper over, and placed in warm water. If, then, the colour leaves the shaded parts of the paper, where it has been protected from light, in ten or fifteen minutes, it shows that the mixture is fairly correct, and the coating of the sheet of paper can be proceeded with.

The paper, we will suppose, has already been cut to the required size before being sensitised. It is better to have it a little larger than the size of the negative, since the outside edges can then be trimmed in places where the colour may have collected unevenly. Then a sheet of thick blotting paper, which will absorb excess of pigment, is laid on a drawing board ; on this we pin at the four corners the paper to be coated. The brushes must be ready to hand, making

sure that they are clean. The pigmented gum is poured into a saucer as more convenient to dip into.

Dipping the brush into the saucer, we charge it fully with the mixture and smear the paper, starting at one end and drawing the brush up and down until the surface is roughly covered, filling the brush meanwhile with colour wherever required, and as quickly as possible. Then taking the badger softener, holding it as shown in the illustration, we draw it across the paper from left to right, with a few down strokes. It will be noticed that the pigment follows the strokes in streaks. Next a few strokes are given at right angles to these, and the pigment will follow the new direction, but with the streaks less marked, as the pigment is becoming more evenly distributed. The softener is again moved from left to right, and then *vice versa*, using less and less pressure, until all streaks and the unevenness have disappeared. When it is seen that the pigment is getting dry it should not be touched again.

Practice will overcome all difficulties ; and though it is desirable to get an even surface, it is not an absolute necessity. We should

Plate No. 1.



CLOVER NO. 1.

Plate No. 2.



CLOVER NO. 2.

Plate No. 4.



CLOVER NO. 4.



PIERETTE.



DARAWA NO. 1.





BEATRICE NO. 1.

be content to get it as nearly even as we can, as we shall find that every subsequent operation will bring us nearer the desired attainment. As the paper stretches, the pins must be moved to tighten it up. The pigment should move freely under the softener when it is first applied, and should follow the directions of its strokes. If, by sticking and dragging, it makes it almost impossible to remove streaks, there is probably an excess of gum, although the fault may be due to the compound being put on in too dry a state. Plenty of colour should be put on the paper, but at the same time excess must be avoided.

On this point, as on others, experience will be the best guide. Should it be found that there is an excess of coating, the badger must be washed quickly in water, and dried thoroughly on a towel, and then the operation of softening gone through again. The excess will be thus taken up. The coating may be either thin enough to see a pencil mark through, and this will be best to aim at in the beginning ; or laid on as thickly as our skill will enable us to lay it, for the thicker the coating is, the more difficult it is to get evenness.

THE "SINGLE PRINT."

If we find, try as we will, that the coating acts stupidly, and does not become even



The use of the badger softener.

before portions show symptoms of drying, we can hold the softener at right angles to the paper and dab, dab, dab—stipple, stipple, stipple—all over the surface until there is a fine-grained coating everywhere. Such a paper may be kept for bolder effects, where a little grain will not matter.

The coating may be done in an ordinary light, and the paper dried quickly before a fire, or in the drying chambers of the bath-room, or slowly in a dark room, but when dry it must be carefully protected from actinic light, for it is then very sensitive. Only a small quantity should be made at a time, since it works very much better whilst still fresh.

Having followed these instructions in detail, we will select a negative and expose.

The negative that will give the greatest number of tones is a thin one with gentle gradations, one that will give a fine soft print on P.O.P., or that would be suitable for enlarging. A plucky one is only suitable for certain effects, and generally speaking will give hard prints, whilst a strong one is better for use with a paper slightly sized that will retain a trace of pigment and require a brush during development.

The exposure we must judge by an actinometer, and one in the simplest form, made as follows, will be found suitable:

On a piece of glass of half-plate size a piece of tracing paper is laid—cigarette papers will do and are handy—then other pieces at intervals of three-eighths of an inch; No. 2 of two thicknesses; No. 3 of three thicknesses; and so on up to twelve; then black paper is gummed on to each side, leaving a strip threequarters of an inch, as in the illustration (page 20). This is used in a half-plate frame, a strip of P.O.P. being put underneath. Under the negative from which we are about to print, a piece of P.O.P. is put, and both frames are placed out to print together. When, by examination, the P.O.P. under the negative is found to have printed out fairly well, and just a little lighter than one would like a toned print to look, the paper in the actinometer is examined, and a record kept of the number printed through; or, better still, the strip of paper may be kept in the dark for reference. The gum paper is then put in the frame under the negative, a fresh strip of P.O.P. in the actinometer, and both frames are again put out to print. The P.O.P.

in the actinometer is examined, and when it is found to match the record, we may judge the exposure to be approximately correct.

Taking next a dish of warm water, we immerse the gum print, face downwards, letting it soak and develop mechanically. The whole operation of its development may be done in full daylight, the paper not being sensitive when wet. If examined during the process, the pigmented gum will be seen to dissolve gently from the high lights, and so on gradually down to the depths in proportion to the amount of light action it has received.

When development has gone far enough, the print is lifted out gently, and hung up to dry, the greatest care being taken to avoid touching the surface in any way ; for the pigment is now in an extremely delicate state, and might easily be removed by the slightest friction. Dealing with this first print we have not attempted any modification or alteration of tones, but have left it to develop out fully of its own accord. We need to learn first the capabilities of the process, gaining experience which we may later turn to advantage.

THE "SINGLE PRINT."

We will now expose another piece of the same paper under the same negative, and print a little deeper than on the previous actinometer test, beginning to develop by immersing in warm water as before. Immediately the high lights appear, the paper is taken out of the water, and laid, face upwards, on a sheet of glass rather larger all round than the paper. The print first made should now be carefully observed, although it might be better to make a matt surface silver print from the negative, and on this roughly to correct the tones with a blacklead pencil. With this in front of us we should be able to devote the whole of our thought to the actual development, and the carrying out of the modifications observation has suggested, for probably in the original negative the lights are scattered and conflicting, and our object now is to bring them into order and harmony.

A very useful auxiliary for local development will be found in the household fresh water tap, but it is important to assure ourselves first that the supply of water is completely under our control, since a sudden and jerky outburst might seriously damage

a picture, and destroy its delicate half-tones.

To secure this control, I would advise the use of a little attachment for the end of the tap, which is supplied by ironmongers at sixpence each, and is known as an "anti-splash." When this is attached the water passes through a filter of fine wire gauze, and falls in a smooth, round, and unbroken column, which can be varied from one-sixteenth of an inch in diameter to half an inch in diameter. The tap is turned on slightly, and a gentle stream of water allowed to fall on the edge of the glass, and to flow gently over the print. The glass, which is held in the hands, is to be inclined at an angle, and its upper end, where the water strikes it, should be held about two inches from the tap. If the pigment is seen to be dissolving very gently, and the image to be appearing slowly, the glass is moved so that the stream of water falls where the highest light should be. This spot should be allowed to appear a little, but not fully ; we then proceed gently to let the whole of the picture develop out by moving the glass and varying the angle so as to keep the water to the spot where it is wanted. We must not

let it run over the light tones too much. The print is lifted away, and examined carefully from time to time. When it has come fairly out, but in a somewhat low key, we will return to our highest light and complete its development.

Should the dissolving of the colour now appear to have come to a standstill, the glass plate is lowered so that the water may drop from a greater distance, and therefore have greater force, but we must let it drop gently, gently, gently; for at this stage it is easy to destroy, and ever so little too much force will give occasion for vain regret. If the pigment is firm, we can lower our glass still further, so giving greater force to the water, and thereby fetching up the lights we want, and the subsidiary ones in due relationship.

In case of considerable over-exposure, the finger may be applied to the nozzle of the tap, and the water thus squirted with great force on to the picture; but this only as a last resort, since with ordinary exposure the picture would entirely disappear.

With a lightly exposed print, the stream coming direct from the tap must never be

allowed to touch the pigment, but must be made to strike the glass first, and thence to flow in a gentle stream, and be diverted whither it is wanted. I should not, however, advise very light exposures to be attempted at first: We can now expose another piece of the same paper, and under the same negative, giving it yet a little more exposure. It is placed in the cold water, face downwards, and left there for ten or fifteen minutes. If nothing has then appeared, a little warm water is added, bringing the whole to about 70° Fahr.—not hotter. It is watched carefully, and then, if no signs of the picture are observable, the paper is taken hold of by the corner with finger and thumb and agitated gently. Sometimes the pigment will then dissolve in little clouds, and the picture come up steadily and evenly. At other times a little hotter water may be applied, and a little more time given; but, except in extreme circumstances, water over 80° Fahr. should not be used, for the print is then likely to get quite beyond control, and the pigment to break away in unexpected places.

When the outlines have developed out fairly well, but the picture seems somewhat

murky and heavy, it may be lifted out of the water and further developed in the way M. Demachy recommends as follows :

" In a large developing bath put a little wooden stand about three inches high that will allow the glass to rest on it and be inclined at various angles, thus enabling a flow of water to be made more or less rapid at will. Two sponges are used, one small enough to be held in the palm of the hand and the other larger, as well as a can of warm water. The larger sponge is filled with cold water and gently pressed at a few inches distance from the glass on which the water falls, flowing over the print in a gentle stream where the pigment is to be removed. Great care should be observed and judgment exercised. If the print resists the cold water, warm, and still warmer, may be used, until development is seen to be fairly started. Then local treatment may be recommenced, and the picture developed according to the impression we have in our minds, or the guide print before us."

Dark shadows may be lightened up by taking a small sponge charged either with cold or warm water, as may be necessary,

and squeezing it gently close to the paper so that a gentle flow falls over the spot to be worked on—the glass being inclined so that the water may run off from the darkest side. When the picture seems fairly satisfactory, lift the glass, with the paper still adhering to it by suction, and incline it against a wall to dry. Examine it about ten minutes later, and if you feel that some light would be better raised, or a bright speck somewhere would be useful, a sharp point of blotting paper may be applied gently and firmly, or the point of a penknife, or a dry brush, or anything else that experience may dictate.

After the print has once started to dry, on no account must the print be put into water until the drying is complete, as otherwise the parts where the pigment is still wet may get their colouring matter washed completely away, or be so much lightened that the values are destroyed.

Still another trial exposure, on a piece of the same batch of paper and under the same negative, may be made, and still more exposure given. Development will be commenced by immersing the print in cold water, which can be raised to 65° or 70° Fahr.

THE "SINGLE PRINT."

if in ten minutes there are no signs of the picture. When the highest lights are faintly visible, a piece of glass is slipped under the print to keep it perfectly flat during the further operations ; and then a fairly large and flat camel-hair brush is drawn gently over the surface of the print while it is still under the water. The tip of the brush only is used, for if the thicker part is used streaks may ensue as a result of the extra or unequal pressure. The brush is passed lightly over every part, always preferably in the same direction. The general outlines of the picture will then be seen distinctly in the light and middle tones, but the darker ones will probably require careful local treatment with a soft and pliable brush before they disclose the form and detail hidden beneath the surface of the pigment. From time to time the glass and print should be lifted out of the water, carefully compared with the guide print, and then further developed where it seems desirable.

In the first stages all brush work is done under the surface of the water, but at the last, when the picture is nearly finished, the print should be pinned to a drawing-

board and inclined at an angle for a few minutes until the surplus water has drained away, leaving the pigment still moist and raised on the surface of the paper, and so in an excellent condition for such further treatment as may be thought desirable. With the tip of a flat, dry brush the moist pigment can be dragged or distributed over any portion of the picture that is too light in tone ; or harshness may be modified and a hard edge softened by a light flick on the surface from the soft, dry brush. Unsatisfactory details, or even a background, can be entirely removed by the use of a small hog-hair brush, and with a fine sable brush small dark spots can be lifted and delicate high lights cleared.

During the latter operations the brush should be frequently rinsed in a glass of clean water, and then, before being used again, should be dried on a sheet of blotting paper.

After the picture has been taken out of the water and allowed to dry partially, it must on no account be immersed again until the whole of it is thoroughly dry, as otherwise the values will be destroyed by the dissolution of the still moist pigment. .]

Development by the brush is certainly the most difficult method of any, because of the ease with which the photographic image is destroyed. It is also the most successful, the most masterly results being obtained by it. Caution and restraint are indispensable, since every stroke of the brush tells either for or against success; while an acquaintance with the principles that govern the production of all beautiful things is also essential.

By attentive study of those pictures which are known to possess some quality that conveys the sense of beauty to all beholders, we may imbibe something of their spirit, and a knowledge that will help us in our future strivings after art. To a few favoured beings the just appreciation of the truly beautiful calls for no study, being intuitive. Unconsciously they assimilate its principles, and as unconsciously exhibit them in all their performances. Their art work will therefore be always beautiful, in so far as they are true to themselves and their higher instincts. To this result we all may aspire, even though we may not attain to it, since, by careful and diligent study of certain laws

and rules, we may at least learn how to avoid the production of tasteless and ugly things. To fall short of this would be indeed to neglect a most obvious duty.

It will be understood that, though we have up to the present time kept to one method of development with each of our trial prints, in future working we may resort to any method that may be thought best adapted to bring about the end in view. We may, for instance, commence with mechanical development, and finish with spray and brush—a process which will be more minutely described when the method of producing our different illustrations is exhibited in detail. Should, at any time, a print, when first placed in a cold water bath, show signs of rapid dissolution, it should be allowed to develop for a short time automatically; but if the high lights appear to be in imminent danger of disappearing in the form of white paper, the print is to be taken out at once, whilst the image is still dark, and laid on blotting paper, face upwards, and inclined at a slight angle, so that the surplus water may drain away. If it is allowed to dry slowly in the dark, it may afterwards be placed in water

THE "SINGLE PRINT."

again and developed with the brush or spray, as the pigment in the high lights will then be firm and more amenable to treatment.

If we so choose, we may partly develop any of our prints, and after drying and storing in the dark, finish then at our leisure. Development will proceed in exactly the same way as before, but the pigment will be harder and take longer to dissolve, consequently there is more time to think out our picture, though there must be, of necessity, some loss of freshness and crispness.

V.—THE WORKING OF THE
“SINGLE” PRINT (*Continued*).

THE second method of preparing the pigmented paper is as follows :

A.—Gum 2 ounces

Water 5 „

B.—Potassium bichromate 1 ounce

Water 10 ounces

C.—Venetian red (in powder) mixed
with water to the consistency of
cup custard.

Five drams of A, four drams of B, and two drams of C (all liquid measure) are taken. The bichromate being mixed with the pigment and gum, there will be no previous sensitising of the paper, which is cut the required size and pinned on a drawing-board, which is first covered with a sheet of blotting paper. The actual coating is said to be a little more difficult than in the previous method, owing to some action of the bichromate on the gum, but it is not enough to cause embarrassment.

The proportions given will serve as a guide, but may vary considerably. If, on

attempting to lay the coating of pigmented gum on the paper, any difficulty is experienced in distributing the compound, through its clogging under the softener, and refusing to follow the direction of the strokes, a little more of the bichromate solution may be added, and even again a little more if necessary. The compound should work easily under the softener, and follow its movements with just a slight drag. It must not be too thin nor liquid enough to run when on the paper; but should move under the brush easily without its being very wet. Only experience can really decide in each case the exact proportions of the gum, pigment, and bichromate solution.

In the formula a definite amount of pigment, which I have tested and found to work well, is named; but no hard and fast rule can be laid down to suit all cases. It is well to commence with a little, and to increase the quantity as experience and dexterity are gained. Personally, I neither measure nor weigh my proportions, but then I have had six years' experience of gum printing, and long before my readers have had as much they will possibly cease to weigh and

measure, knowing instinctively the quantities and the thickness or thinness of the coating required to produce a particular result from a given negative. It will somewhat surprise the beginner to find how great an effect can be got out of a very thin-looking coat of pigmented gum, since it is difficult to judge its depth, even if something white is put in contrast with it.

Black has a much greater covering power than any other pigment, and therefore a less quantity must be used. In mixing, ten grains should be added to one ounce each of gum and bichromate, and then its covering power tested. A mark is made with a B blacklead pencil on white paper, and, using a small brush, this is covered thinly with the mixture. If the pencil mark can still be seen very distinctly, a little more pigment must be added. The mark should be visible if looked for, but should not proclaim itself.

Shades of brown, from black to red, made from mixtures of lampblack and burnt sienna, must be used in greater proportion as they approach red, but each of them may be tested as above.

The tone of the brown will be largely a matter of taste, and the user will be the best judge of what is required. Two parts of sienna to one of black will give a pleasant brown, which may either be made colder by adding black, or warmer by the addition of sienna. The colour should be judged before the bichromate is added, or due allowance made for its strong yellow tone.

The further procedure of coating and laying the paper for the second method is exactly as that described previously; as, too, is the development. The time of exposure, however, is considerably increased—probably to a fully-printed picture in P.O.P., or twice the extent of time required for paper that is sensitised with bichromate before the pigmented gum is applied; and this necessity is, in dull weather, decidedly a drawback. For general purposes the first-named method is the more certain and the better one, and I advise beginners to keep to that until they have gained some experience.

The correct length of exposure for either method is difficult to estimate, so many factors entering into consideration. For one thing, colour and thickness of pigment have

an important bearing, whilst the effect desired and the method of development employed are also points of consequence. Fortunately, we have great latitude, and it will be well, in first essays, to allow plenty of exposure; seeing that it is possible, even in a severe case of over-exposure, to bring out the picture by the application of hot water or prolonged soaking in water, even to the extent of many hours.

Under all circumstances I advise the use of the actinometer, although with some pigments the printed image is distinctly visible, particularly when the paper used is presensitised. If we use the actinometer we can register exactly the amount of exposure that a print has received, and its subsequent behaviour during development will enable us in the long run to calculate approximately the correct exposure for any method of development.

In cases of extreme over-exposure, when, in spite of prolonged soaking, the picture declines to show itself at all, a little caustic potash may be added to the water. In many otherwise hopeless cases this will start the development, which may then be proceeded with in the usual way.

But I would again emphasise the fact that only correct exposure will give the finest results, and that, although we may, despite a very large amount of over-exposure, get good prints, we ought to aim at learning from our experience exactly how much exposure to give; for there is a luminous quality and a richness about a print that is caught at the right moment which raises it as far above an ordinary print as an artist's proof etching excels a common pull from the same plate or block.

Should it be desired to remove the yellow stain sometimes left by the bichromate, it may be done after the print has been thoroughly dried by immersing it in a bath of alum, but this is not a necessity, as the stain always disappears of its own accord when the print has been for some time exposed to light. We should not be tempted to varnish gum prints, or we shall lose one of the chief charms of the process. If the pigment looks dull and heavy, the print may have a coating of gum and bichromate alone, and then, after exposing to the light for a short time under the same negative, may be developed in the usual way. We shall

thus get a glaze in varying degrees, bright in the shadows where gloss is most required, and gradually thinning until in the high lights there is just the slightest film—an entirely different thing from a coat of varnish or fixatif, with a uniform glaze all over the print.

No doubt many of my readers have met with conflicting and even seemingly contradictory statements about gum working. Such variations, however, are due rather to the extreme elasticity of the process than to error on the part of the practitioners. Every worker is in truth justified in adopting just that particular method of working which best suits his own personality, and that is the method which he naturally describes first.

All the illustrations here given are from gum prints made by the formulæ described, and none of my work at present is done in any other way.

Each worker, however, will like to experiment, and I therefore append here several alternative formulæ, which other workers may perhaps consider preferable.

VI.—FORMULÆ.

FOR SIZING THE PAPER.

- I.—Hard gelatine .. $\frac{1}{2}$ ounce
Water 45 ounces

The gelatine is first soaked in cold water for an hour or so, and then dissolved by heat. The solution is allowed to stand all night, and in the morning it will be in a jellied condition. The jelly is then broken up with a fork, or forced through fine muslin, and applied to the paper with a stiff, flat hog-hair varnish brush, working it well into the paper and avoiding streaks.

II.—Nelson's opaque

- gelatine 60 grains
Water 5 ounces

The gelatine is soaked in cold water and dissolved by heat as in the previous formula, but it is applied to the paper whilst still warm, using a stiff brush to rub it well into the paper, and then distributing it evenly by the use of the badger softener.

COATING MIXTURE FOR PAPER PREVIOUSLY
SENSITISED IN A SATURATED SOLUTION OF
POTASSIUM BICHROMATE, AND DRIED AND

STORED IN A DARK PLACE.

- A.—Gum arabic .. 2 ounces
Cold water .. 5 „

Half an ounce of A and half an ounce of water are taken, and vegetable black (twelve grains, in dry powder) is added; or for red, twenty to thirty grains.

SENSITIVE COATING MIXTURE.

- A.—Gum arabic .. 2 ounces
Cold water .. 5 „

- B.—Potassium bichromate saturated solution.

Of these, half an ounce of A and half an ounce of B are taken, pigment being as above.

SENSITIVE MIXTURE FOR PAPER THAT IS TO BE DEVELOPED BY FRICTION (BRUSH, SPRAY, ETC.)

- A.—Gum arabic .. 2 ounces
Cold water .. 5 „

- B.—Ammonium bichromate 1 ounce
Water 10 ounces

- C.—Chromic acid .. 1 ounce
Water 10 ounces

Four drams of A and two drams each of B and C are taken, pigment being added to

FORMULÆ.

suit—say thirty to forty grains of red ochre or Venetian red. Development is commenced in the ordinary way, but the chromic acid renders the pigment firmer and less liable to come entirely away under the action of the brush. The grain is also finer than in the ordinary formula.

M. Demachy finds it impossible to give any hard and fast formula, but suggests that workers should commence with the following : Gum, a fifty per cent. solution made in cold water; potassium bichromate, a saturated solution. One dram of each solution is taken, and forty grains of red ochre added. Gum or bichromate solution is added, as may be found necessary, for easy coating of the paper. M. Demachy does not weigh his colours, and strongly advises beginners to make repeated trials, and thus learn the proper degree of consistency that will allow of even coating. All his beautiful work is produced by one printing, and if I had any hope that my readers could attain to his proficiency, I would strongly advise them to give every attention to so doing. M. Demachy, however, stands alone, and I know no other worker who is able to give such consistent

technical perfection. For this reason I advise my readers to try the "multiple" process, since by it very fine results are obtained with comparatively little technical skill. When they have gained more experience they may try to obtain the full gradation in a "single" printing.

Mr. Chas. Moss's Formula.—Gum, one ounce; water, two and a half ounces; potassium bichromate, a saturated solution. Half an ounce each of the gum and bichromate solutions are taken, and ten grains of lampblack (dry powder) are added. (Lampblack has a much greater covering power than other blacks, and is very light in weight.)

Mr. J. C. S. Mummery's Formula.—Gum, four ounces, water, twelve ounces; potassium bichromate, a saturated solution. One ounce each of these solutions is taken, and forty grains of ivory black and eight grains of burnt sienna (powder colour) are added thereto. This gives a pleasant brown tone.

The late Mr. W. J. Warren's Formula.—Thirty minims of water and twenty minims of a forty per cent. solution of gum are taken, and one-third of a twopenny tube of Venetian red (water colour) added thereto.

FORMULÆ.

This mixture is a sufficient quantity to cover a sheet of paper 15×12 . The paper should previously be sensitised in a ten per cent. solution of potassium bichromate.

DR. MILLAR'S FORMULA FOR PAPER THAT WILL KEEP INDEFINITELY, AND IS SENSITISED BY IMMERSION IN POTASSIUM BICHROMATE.

A.—Gum arabic	..	$1\frac{1}{4}$ ounces
Water	$3\frac{1}{2}$ „
Salicylic acid	..	4 grains
B.—Chrome alum	..	45 grains
Water	$3\frac{1}{2}$ ounces

A, two ounces ; B, one and a half drams ; water, one and a half drams ; lampblack, ten grains are taken. After coating, the paper must be allowed to dry, and may then be stored until required for use, or may be sensitised at once by immersing the paper in a five per cent. solution of potassium bichromate. It must be dried in the dark.

GERMAN FORMULÆ.

Herr Renger-Patzek.—The paper should have a preliminary sizing of best glue, eight grains ; water, one ounce. When dissolved, one and a half ounces of water containing eight grains of alum are added, and then

two drams of alcohol. The sensitive mixture is made up as follows :

A.—Gum arabic	..	1 ounce
Water	2 ounces
B.—Ammonium bichro-		
mate	48 grains
Manganese sulphate	48	„
Distilled water	..	1 ounce

For use we take—

Albumen (white of egg)	6 drams
A solution 2½ „
Colouring matter, about	100 grains
B solution	.. 8 to 10 „

Dr. Galler.—This worker suggests an all-round mixture made up of sodium bichromate, one part ; gum, two parts ; water, ten parts ; with colouring matter added to suit the personal taste of the worker. The addition of sugar, honey, or fish glue to the mixture has no beneficial effect in his opinion.

Herr Watzek.—Gum arabic, forty per cent. solution ; potassium bichromate, ten per cent. solution ; adding one drop of carbolic acid to each ounce of solution as a preservative. For use, equal parts of each are taken and a requisite amount of pigment.

Herr Hoffmeister.—Forty grams of gum

FORMULÆ.

are dissolved in sixty c.c. of a three per cent. starch paste, and a few drops of carbolic acid added. Potassium bichromate is used—a saturated solution. Equal parts of each are taken, and sufficient pigment added to give the required density of shadow depth in the picture.

CLEARING BATHS TO REMOVE BICHROMATE STAIN.

Alum, one ounce ; water, twenty ounces ; or a four per cent. solution of sodium bisulphite

VII.—“ MULTIPLE ” PRINTING.

WHEN the reader has made practical experiments for himself with the guidance of these instructions, he will realise the truth of the paradox that gum-bichromate printing is at once the easiest method of printing and the most difficult—very easy to get some result, but equally difficult to get a perfect one. Failures are as frequent as great successes are rare. The minutest of defects or faults may prove the marring of a picture. A little too much action of either the brush or spray and there results too light a tone, affecting the whole picture.

It is these difficulties that discourage so many and cause them reluctantly to give up a process that in other respects has for a worker so great a fascination. No doubt experience lessens these in force, but they still exert an influence which I would not unduly minimise.

With the “ multiple ” printing, however, they practically end. For, however many the faults may be in the original print, they can be remedied by supplying a fresh coating

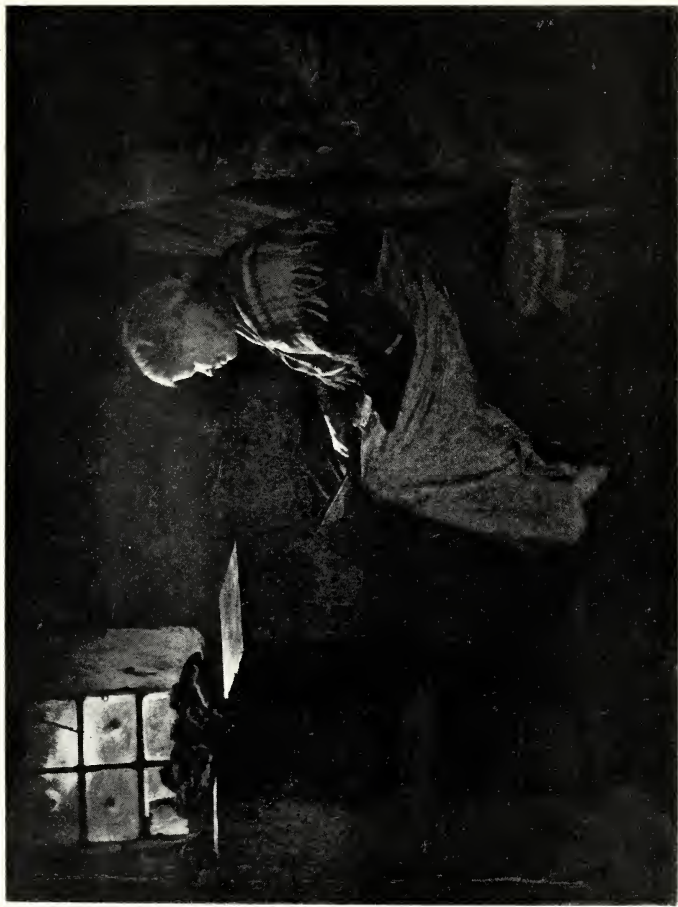
of pigment and again exposing and developing, these operations being repeated as often as required. This, though it lengthens the time required to make a picture, makes the process delightfully simple. The total of time spent on a picture is indeed but small, yet, as a whole day must elapse after each development process to allow of the paper drying thoroughly before beginning again, it often covers a long period.

The picture being built up of successive layers, each coating is a thin one, and is consequently much easier to lay on. Exposure is lighter, and development is in the main mechanical, being carried out in entirely cold water. The chief drawback hitherto has been the difficulty of getting the print in correct register during successive printing: a drawback, however, that seems no great one to such as can exercise patience and care in superimposing the print on the negative. Guide marks on the negative, such as crosslines at the four corners, will make corresponding marks on the print, to be used as guides in subsequent operations.

But this is, after all, a makeshift method, and liable to such accidents as movement



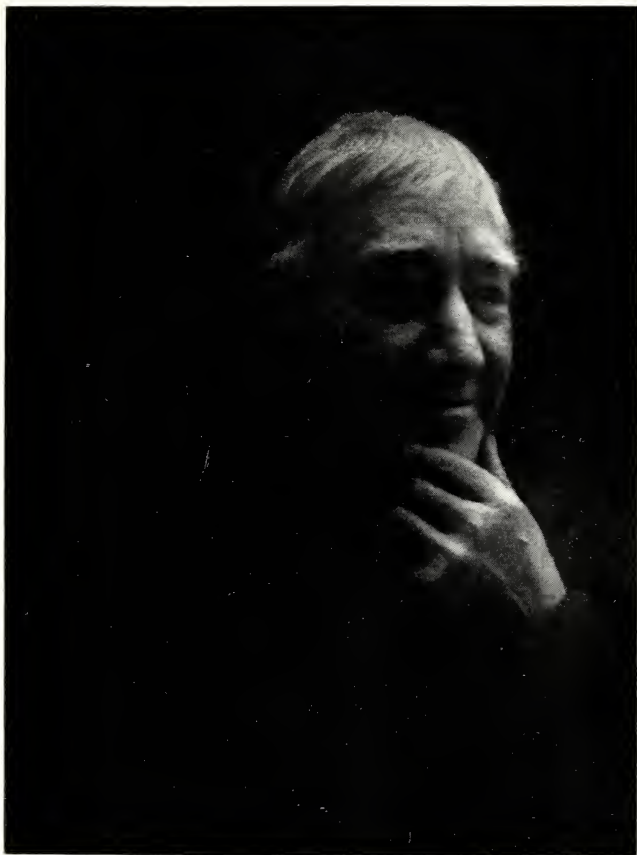
BEATRICE NO. 2.



THE WATCHER.



ANTICIPATION NO. I.



ANTICIPATION NO. 2.



EVENTIDE NO. 1.

Plate No. 14.

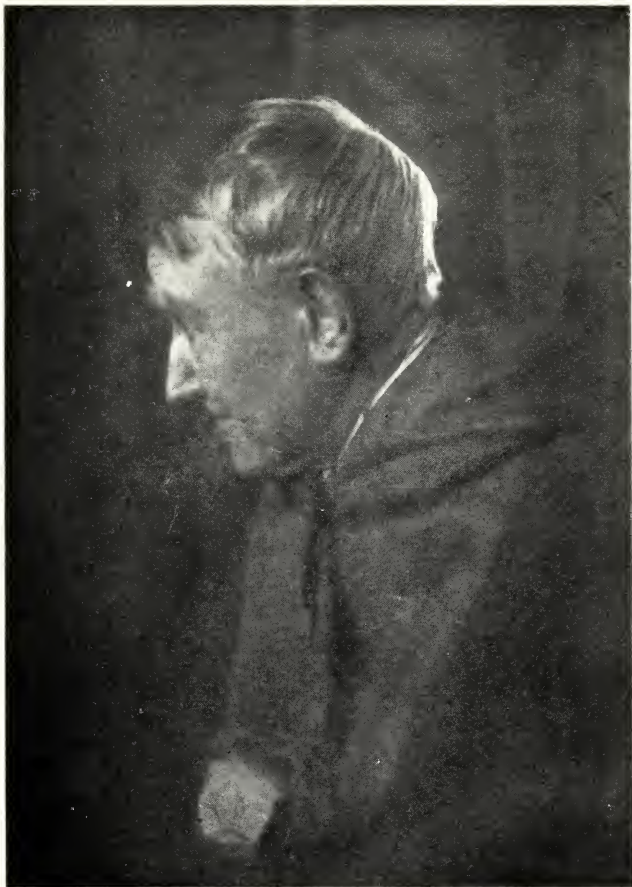


EVENTIDE NO. 2.



HEAD NO. I.

Plate No. 16.



HEAD NO. 2.

whilst the spring of the frame is being adjusted—a movement which may pass unnoticed until it is too late, and besides, it takes up more time than one is always able to spare. After trying many alternatives, which were more or less successful, I devised the following, which practically disposes of every difficulty, and renders false registration impossible, even to the most careless worker.

Instead of paper, card must be used, and herein comes a little difficulty. The cards must be of hard texture throughout, able, without coming to pieces, to bear several hours soaking in water.

It will not matter if the edges swell and roughen a little; indeed, it is almost impossible to prevent that occurring. Winsor and Newton's Whatman water-colour boards stand soaking admirably, but, as I have mentioned before, Whatman's paper does not answer well for gum work, except when well sized, and then only for particular purposes, where a little coarseness does not signify.

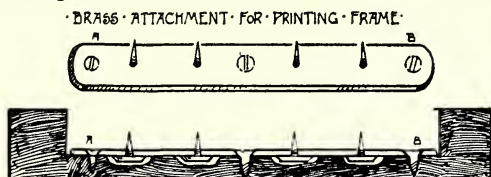
Exhaustive trials of boards already on the market were made without one being found that was satisfactory in every respect, and ultimately a special one was manu-

"MULTIPLE" PRINTING.

factured to order, having a special surface and a board hard enough to stand a considerable amount of soaking without disintegration. These boards, or cards, with every necessary material for the gum process (including the attachments for the frames) can be obtained from Messrs. Southall Bros. and Barclay, Broad Street Corner, Birmingham.

To prepare the cards for use we shall require some very thin sheet zinc cut into narrow strips three-eighths of an inch wide and in length equal to the width of the negative we are using. The zinc can be easily cut with a pair of ordinary scissors, or by laying it flat on a table and then marking the strips off with a rule, as one would in trimming a print. If the zinc is scratched with a penknife or sharp metal point, it can be bent and easily broken along the line so made. Each card has one of these metal strips fastened to its upper end by three paper fasteners, midget size, as in the illustration. For piercing the holes for the fasteners through the zinc and card a thin chisel-shaped bradawl may be used. The cards are in each case the same width as

the negative but longer by three-eighths of an inch, this being the space taken up by the zinc strip.



SECTION OF FRAME SHOWING THE BRASS ATTACHMENT IN POSITION AND WHERE THE WOOD IS CUT TO LET THE HEADS OF THE DRAWING PINS IN.

The printing frame must have a special attachment, which can be made as follows : First a strip of brass about half an inch wide and one-eighth of an inch thick is obtained. If intended for half-plate size, one of the brass springs used for the back of a quarter-plate frame will answer admirably. In this we want five holes drilled, as in the illustration. Any worker in metal will do this readily. In each of the small holes a drawing-pin is inserted, the head of which should be soldered to the brass strip, it being an important condition that the point should remain perfectly rigid. Just a touch of the soldering iron will effect this, and here again the metal worker will officiate. A half-plate printing frame being then taken, one with

"MULTIPLE" PRINTING.

open ends, the strip of brass is laid along the top, spikes upwards; a mark is made where the heads of the pins come, and with a chisel or a pocketknife (if one is not an

CARD WITH THE STRIP OF ZINC ATTACHED.
A.A.A. ARE PAPER FASTENERS AND THE
BLACK DOTS ARE HOLES.

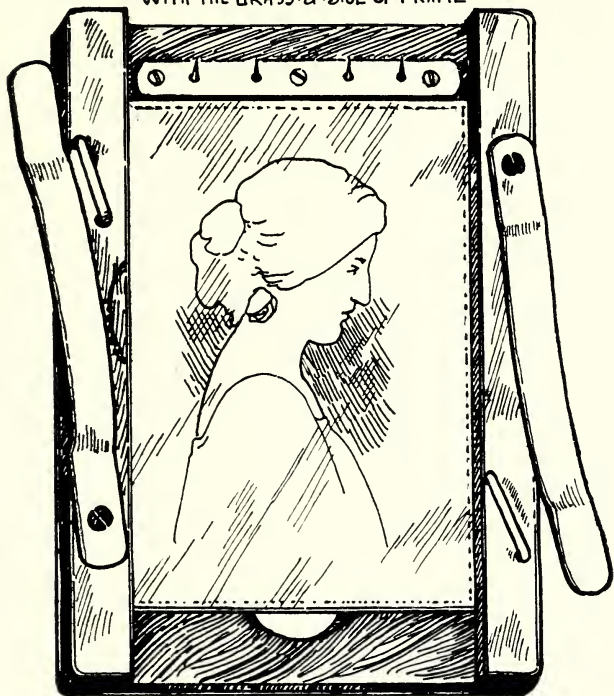


amateur carpenter) enough of the wood is cut away to let in the heads of the pins so that the brass may lie flat on the frame. Then, putting a negative in the frame, it is placed flush with one side of the frame, letting it overlap the wood at the top about three - sixteenths of an inch. The brass

is laid on flush with the negative, and screwed to the frame in that position, using three holes. The card is next taken and placed in the frame with the zinc strip resting on the pins or spikes. It is pressed down firmly, and the zinc and card thus pierced. Absolute registration is secured by this use of the pins and

holes throughout any number of printings. One has only to drop the card on without troubling one's self. The negative is pushed

FRAME FOR MULTIPLE PRINTING SHOWING BRASS
ATTACHMENT AND THUMB HOLES AT BOTTOM AND
SIDE THROUGH WHICH THE NEGATIVE IS PUSHED FLUSH
WITH THE BRASS & SIDE OF FRAME



flush with the side of the frame, and with the strip of brass holding the spikes.

"MULTIPLE" PRINTING.

In a larger size frame the number of spikes would be proportionately increased. For a frame 15×12 I use five. The cards, by this method, do not move when the springs are put down; nor will the negative do so either if sufficient care is used; though to give security to even a careless worker, a hole can be hollowed out in the side and bottom of the frame, through which the thumb or a finger can push the negative flush back to the brass at the top and to the wood at the side.

Since adopting this method, I have discarded every other device for securing registration. The working is so extremely simple and the prints, through their being on card, emerge ready for framing.

If we should desire to use a particular kind of paper which is not obtainable mounted on the special board, we must procure a sheet of moderately stout zinc the same width as the negative used, but three-eighths of an inch longer. This sheet of zinc is placed in the frame and perforated on the spikes in the usual way. Next taking the zinc out of the frame, we lay it flat on a table. The special paper we intend to use is cut slightly smaller all round than the zinc plate, and we now take a

piece of guttapercha tissue (similar to that used for bandages) and cut it to the size of the paper. The tissue now being laid flat on the zinc, the special paper is laid on top of it in position. Over all we place another piece of paper to serve as protection for the special paper. Then we take a fairly hot laundry flat iron, and pressing the paper down carefully, soften the tissue with the heat and so affix the special paper firmly to the zinc plate. Any blisters that may arise can be removed by renewed applications of the hot iron. By this method the paper will be securely fastened to the zinc, and will not stretch or break away when placed in water ; when the printing of the picture is completed it can be removed from the zinc, by holding it a little distance from a warm fire, when the tissue will become softened and the paper easily peel away. The zinc plate is then ready for use again.

In “ multiple ” printing the bichromate is mixed with the gum and pigment and applied in one operation. There is no previous sensitising of the paper ; and since the necessity for dark and thick coatings no longer exists, the proportion of pigment used is smaller. The following formula, I find, works

“MULTIPLE” PRINTING.

well, but there is much latitude, and each one must decide personally whether it is the most suitable for his particular purpose, the most important point to remember being that the coating must be both thin and light.

The formula is as follows :

- | | | | |
|-------------------------|----|----|-----------|
| A.—Gum | .. | .. | 2 ounces |
| Water | .. | .. | 5 „ |
| B.—Potassium bichromate | | | 1 ounce |
| Water | .. | .. | 10 ounces |

(a saturated solution)

- C.—Venetian red (in power) mixed with water to the consistency of cup custard.

Of these, five drams of A, four drams of B, and one dram of C (all liquid measure) are taken.

This mixture should be kept in a corked bottle in a dark place, and will remain in good working condition for some weeks. It is very convenient to have several colours kept ready for use in this way. We may, for instance, start our picture with a brown black, and after the first printing think it would look better if its colour were warmer. Then, instead of using the original mixture for the next coating, we may use a sienna, or even a red one, and by thus varying the

several coatings that we give our picture, may finally reach a monochrome with slightly varying tones, just adapted to suggest in a very agreeable way a variation in the textures. In addition to the pigment ground, and kept in a cream-like consistency, as used in the “single” method, there is now the choice of many others. Indeed, we may, on occasion, take up the colour box and use its contents quite freely, leaving the usual monochrome, and blossoming out into colour prints.

To the busy worker (and the lazy one) the “Syntonous” colours are specially advantageous for “multiple” printing. They are ready for instant use, and a fresh sensitive mixture is made with the minimum of trouble by taking, say, half an ounce of the stock solution of gum, half an ounce of the bichromate solution, and squeezing one inch of pigment from a tube of burnt terra verte, and then mixing them thoroughly with the stiff brush in a saucer. The colour is readily altered by the addition of other pigments, and if we should find that, in our endeavours to get a desired tone, the pigment is in excess, well ! we can thin it again with either of the solutions or both. There is much latitude.

"MULTIPLE" PRINTING.

The cards are coated with the pigment in precisely the same way as before described, the operation being, however, much simpler. The card is flat; there is no stretching of the paper; and the coating is a thin one—advantages, all these, "of great pith and motion." Drying is done quickly before the fire, and the card is then ready for printing.

The exposure is very light, the preliminary trial on P.O.P. being only a faint image, and great care must be taken to avoid over-exposure. Generally speaking, it is advisable for the first coating to be a very thin one, and for it to have the greatest exposure, so that, in development, a thin film of pigment may be left everywhere except in the highest lights. This, of course, means, in the first instance, a flat and unsatisfactory-looking print, yet it is one likely to come out well in later printings, since a thin film of insoluble pigment makes an admirable surface for any later printings. The first printing, however, may turn out just the reverse, *i.e.*, heavy shadows combined with but little half-tone and much clean paper—a product which will not affect the ultimate result.

The examples here shown are cases in

point. In Clover No. 1, exposure was fairly light, too light in fact, and the colour washed rapidly away when the card was placed face down in the water. The colour was only retained where the negative was extremely thin, namely, in the hair, and leaves, and eye. A little pigment was left in the dark shadow of the face, but that was removed by passing a brush over. The reason for removal was that, owing to the short exposure, the pigment under the denser parts of the negative was but imperfectly held, and washed away unevenly.

For the first print, as already said, I prefer to have one that gives the half-tones, because the thin film of pigmented gum, which extends all over the prints, except the highest lights, forms a most efficient sizing, from which the pigment in later paintings develops readily. If, on the other hand, the half-tones are left to the last, some part of the original white paper will be left exposed to the softening action of the water during possibly perhaps two, three, or four printings. The size may partly dissolve out, and the surface get soft. Now, if we have a thin layer of insoluble pigment left by the

first printing over the whole surface, and if a subsequent printing is not satisfactory (through possible unavoidable over-exposure), and will not develop without such excessive friction as would tend to destroy gradation, in such a case we can take a scrubbing brush and scrub with it hard, and so remove the faulty layer, leaving the original printing and the paper inviolate. Now if, as in our print No. 1, we had a considerable amount of white paper unprotected by insoluble gum, and our second printing went wrong, we could not resort to the scrubbing brush without considerable risk of abrasion to the surface of the paper.

In example No. 2, a second normal coating was given and developed mechanically. The head seems to be now correct, but the drapery, owing to the greater density of the negative, is absent; for, had it been allowed to print sufficiently to retain the pigment, the face would have had too much exposure to develop without a prolonged soaking. In such a case the negative might have been prepared by treatment with matt varnish, etc., so as to match the density, but in this instance it was not done. A hard negative needs

special treatment in gum, and with that splendid results can be obtained, as delicate and soft as desired.

In No. 3 a thin coating of pigment was applied and duly printed with the head masked. Sufficient exposure was given to retain the pigment in the drapery, and the print was again developed, when the pigment dissolved entirely from the face, being retained only where its presence was desired. A few touches with the brush gave a little lightness to the drapery, and the final result is shown in No. 3.

The masking of the head during the last printing was done by cutting a piece of brown paper, to cover the head roughly, and fixing it to the outside glass of the frame by a spot of mountant in the centre. The edges of the paper were fringed or serrated to soften, somewhat, the outline, and the print was further softened with a brush after development had taken place, and the card was partly dry, or when the excess of water had disappeared. The few touches to the drapery were all added at this stage. If it had been desired to confine the extra printing to more definite lines, the following

“MULTIPLE” PRINTING.

method would have been used :

First coating of pigment would have been applied all over the picture. When that was dry a glass of water, a piece of white blotting paper, and a fairly large water-colour brush that will come to a point, say a duck quill, would have been taken, the brush charged with water, and the picture carefully painted over, where this last coating of pigment was to be dispensed with. The card for this purpose would have been placed in a flat position, and as fast as the water was applied to it, dried with the white blotting paper. The brush would have to be kept clean, and the water applied freely until all traces of the superfluous pigment had been removed. The water in such a case must not be allowed to touch any portion of the picture on which the pigment is to be retained ; and as the paper is sensitive, work has to be performed in a dull light.

This method places great power in one's hands, as the pictorial worker will readily see. For instance, had I desired to get on the background a greyer tone than that on the face, the grey coating would have been applied all over the picture, and then taken

off the face in the manner described, the outline of the profile being followed very carefully. No hard edge or cut-out appearance will result if the coating is a thin one.

Clover No. 2 is an example from the small negative of Clover No. 1, which is 15×12 . It has had but one printing, and a second coat of pigment in preparation for a second printing. Something then turned up and prevented my going on with it at the time, and it escaped my memory for a week or so, when this second coating proved it to be insoluble. There is, however, much breadth and charming simplicity in this unfinished sketch, if we may so term it, and on the whole it may perhaps afford more pleasure than the more complete one does, at any rate it exemplifies another expression of the same negative.

It will be understood, of course, that, if I so desired, other coatings and printings could be added to this print and that the ultimate result would only mean a slightly lower scale of tones. All the gradations could be obtained, except the highest; the white, *e.g.*, would be represented by a slight layer of pigment, and in general, if we wish

“MULTIPLE” PRINTING.

to lower the tone of a picture, we have only to apply a thin coating and expose to the full light without a negative. This will produce the same effect as sunning a print down, with the added advantage of enabling us to remove the pigment from any light we wish to retain, with the help of a brush and water before the exposure to light.

It sometimes happens, after a picture is finished and framed, and we are better able, through lapse of time, to view it dispassionately and without prejudice, that certain modifications suggest themselves, which we are able to carry out, since at any subsequent time one is able to make additions, just as one might to a painting. I have added a printing to my pictures, as needed, six months after their return from exhibition.

Each print should be left to dry slowly after development, and as a rule a day should elapse before another coating is applied, particularly in the case of pictures with very delicate gradations, in which case to it would also be well to give a full exposure to daylight, so as to harden the film thoroughly.

It is, *per contra*, possible—though I do not advise the attempt—to give a picture four



GROUP OF BOYS.

Plate No 18.



THE ABBOT.



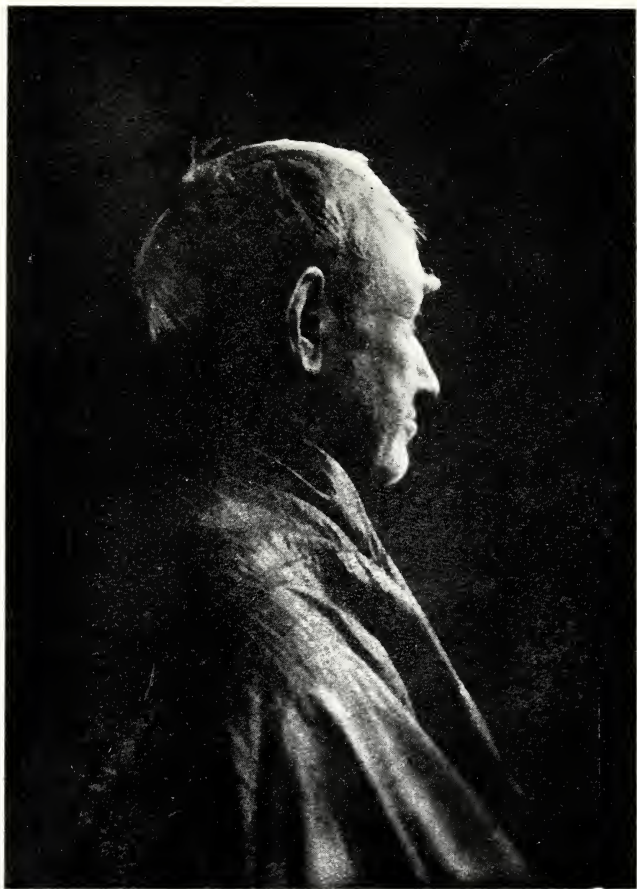


THE KITTEN.

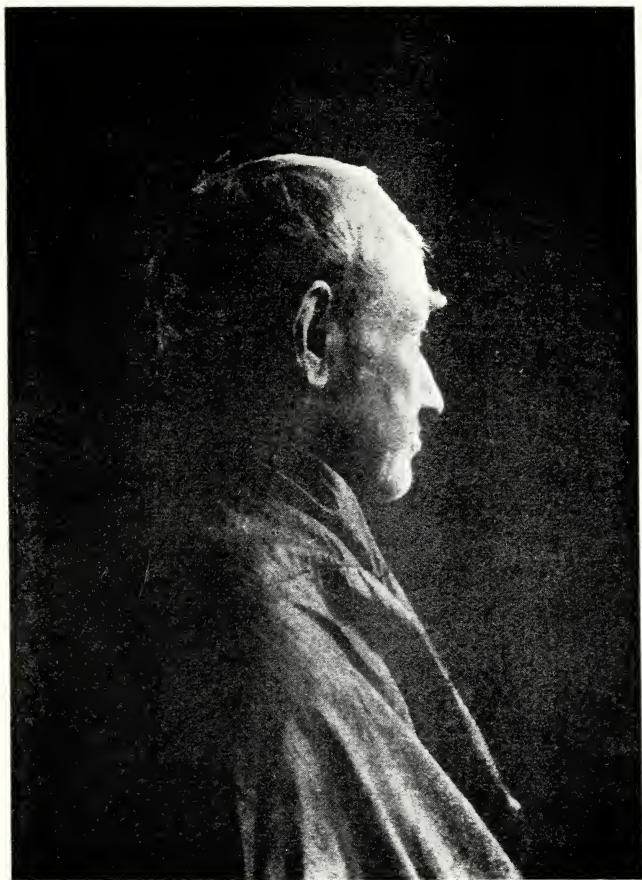
Plate No. 20.



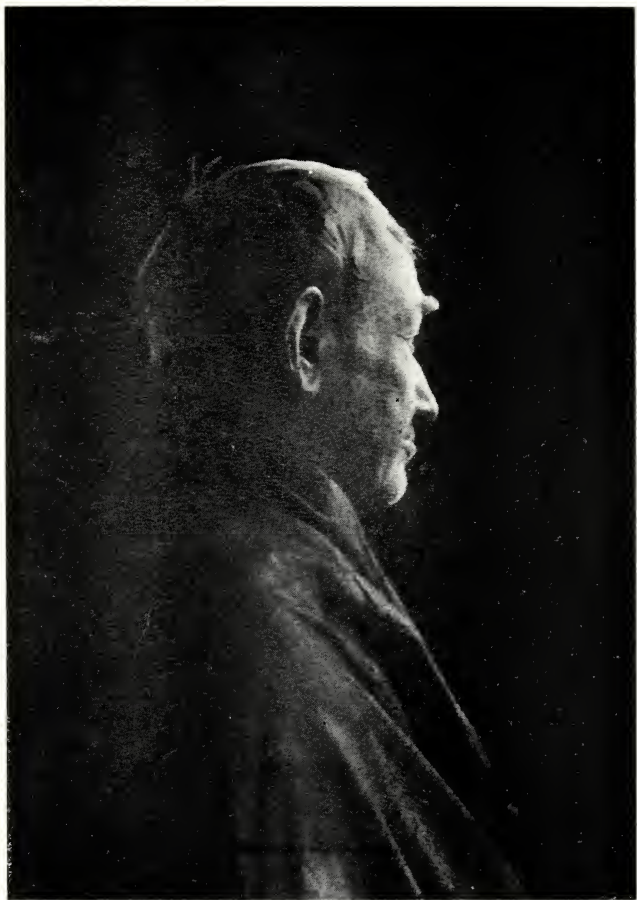
THE PIERROT.



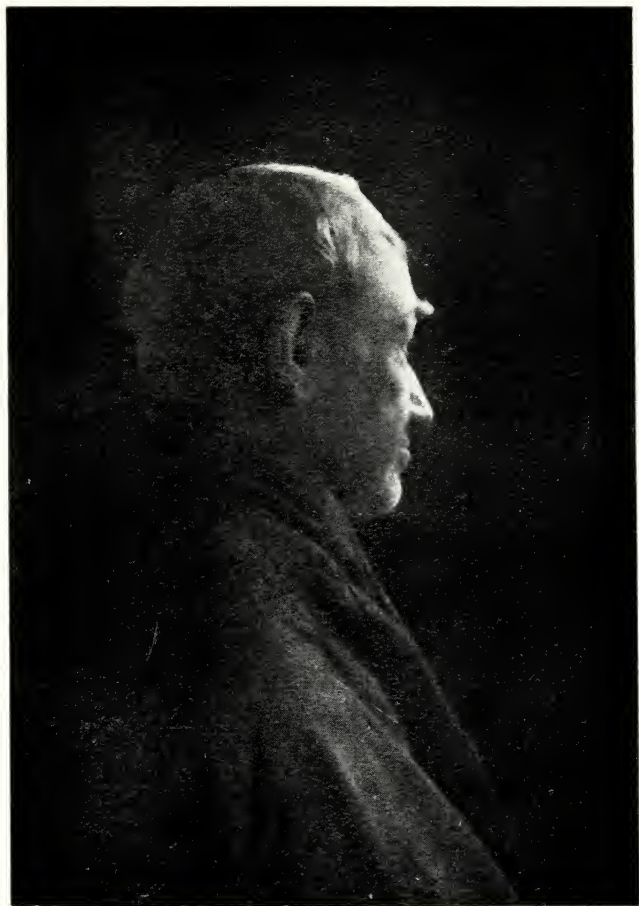
PROFILE NO. I.



PROFILE NO. 2.



PROFILE NO. 3.



PROFILE NO. 4.

printings in one day, by setting the card to dry in a warm room, until all appearance of moisture disappears from the surface. It can then be brought near to the fire, and its drying rapidly completed. This is one of the things that one can do in an extremity, or when one is in a specially rash mood ; but I repeat that I do not advise the practice. The heat may contract the card, and so interfere with registration, but still this risk may be wisely run when speed is of special importance.

Though development should be done, and easily could were our exposure in every case correct, with none but cold water, yet warm, and even hot, water may be applied, as in the “single” printing, without the cards being, in most cases, any the worse. It is wonderful how much rough usage they will stand at times.

I, however, strongly advise correct exposure and cold water. Printing should never be done in a strong light. Exposure needs then to be so brief that there is great risk of overdoing it, and an over-exposed print does not give so good a result as one with just enough exposure.

VIII.—PRINTING IN SEVERAL COLOURS.

NOT the least of the many advantages that the multiple printing gives us is the facility with which the tone of colour can be changed at will. A picture that is too hot may be readily subdued and modified by the addition of a thin coating of grey or blue pigment, and a too cold picture is given warmth by a coating of a colour inclining to red. It is not necessary that any two coatings should be of the same pigment—indeed, each one may be brilliant and varied enough to tempt us to essay the reproduction of the colours of nature in our photograph, even though by so doing we increase our difficulties a thousandfold, since the negative does not in any way help in the choice of harmonising of those colours.

I am supposing that we are using one negative only in the same way that a print would be made in multiple monochrome, and not three negatives, as in the three-colour process, where the negative does play a part in the selection of colours.

We will not dwell on the question of legitimacy or otherwise. If the results justify their production, everything else is beside the question. The reader who thinks that the end of expression in photography lies in monochrome may stay there and content himself in excellent company, whilst the more daring one essays a flight into debatable regions. I must confess that I am not sanguine as to the good results likely to be achieved by the general worker ; probably on the whole it would be better for him to keep to monochrome or tints. We are not all born with a good sense of colour, and, speaking generally, have not had time to devote to its acquisition, but there are undoubtedly workers whose eye for colour is rare and sensitive, and from them we may expect results that will at least vindicate the right of the gum print in colour to be considered.

As the choice of colour is in no way influenced by the negative, it naturally follows that the picture will only approximate to the colour of nature in so far as the worker himself is able to appreciate and render that colour. If, for example, we try to colour a

photographic print by hand, the selection of colours lies entirely with us, and so far the two cases are identical. A skilled artist, however, would be able to reproduce on the photograph many of the tender and subtle passages of colour that go to make up what is expressed by the term flesh-colour, such as blue veinings showing through the transparent skin, delicate reflections, etc., etc.

In a mechanically produced gum print, this result would be practically impossible. At the best, the colour of the gum print is only an approximation to nature, a conventional rendering which will only be justified if its colour harmonies are in themselves pleasing. The question of how far an artist might extend the result by painting is another matter.

The colouring of flowers may be so suggested that both an impression of fidelity to nature, and of delight in the glowing colour, are given, but though there is this impression of truth, upon close examination we shall find much is left to be desired, and it will be well if we frankly admit the extent and limitations of the colour print by the gum process.

The reproduction of "Eleanore" was made from a print in colour, which, though not brilliant, was pleasingly suggestive of natural tones. The hair was a rich deep brown, the face warm and soft, the draperies of a pale blue, and the background of neutral greens. The negative was slightly hard, the face standing out densely from a thin background. In a single printing no satisfactory result would have been possible from it. To secure the details of the face would have meant so prolonged an exposure that under it the hair and background would have become quite insoluble. In any case when a hard negative is used, two or more coatings will be required. First a thin one, with a long exposure, and then a succeeding thicker one, for the weaker parts of the negative, with a shorter exposure.

In "Eleanore" the first coating was a light red, a mixture of English red and raw sienna. The coating was applied very thinly to the card, and full exposure was given to bring out the details of the face. Development was mechanical, and resulted in an image in light red, a faint trace of pigment being retained in even the highest lights of the face.

The second coating was again a thin one of a similar tint to the preceding one, but made slightly deeper and colder in tone by the addition of black and burnt sienna in minute quantities. A full exposure was given, as before, and development was again mechanical. The print, when dry, showed the face in delicate relief, but the hair and background were flat and without detail.

The third coating was a sepia brown, a mixture of burnt sienna and black. This was intended primarily to give colour and depth to the hair, and, in a lesser degree, to intensify the background. The coating was a little thicker than the preceding ones, but still thin. A light exposure, sufficient to fix the pigment in the thin parts of the negative, was given, and development was in the first place mechanical, during which the pigment dissolved entirely from the face, leaving a suspicion of pigment adhering to the eyebrow and nostril. The full strength of the brown was retained in the hair, but the background and draperies were relieved of a little pigment with a soft brush.

The print now presented a rather pleasing appearance, the pale reds of the face telling

out well against the rich brown hair. The background, however, was patchy, and required much pulling together.

The fourth coating was one of cobalt blue, the colour being taken completely over the picture, including the face. It was given a moderate exposure to light, and was developed by first laying it face downwards in cold water. After a little while the pigment commenced to dissolve quickly from the highest lights, and the print was thereupon taken from the water and further developed with a small, soft brush, when the whole of the blue colour was removed from the face. The brush was used because if the mechanical development had continued the blue in the highest lights of the drapery would have dissolved before the face had become clear. As a matter of fact, they did lose more than was desirable.

The print was now complete, and was exhibited in the Salon of 1904. The following extract from *Photography* will describe how it was seen by others: "The figure is formal and stiff, but the colouring, which is subdued, is good, the hair and flesh tints especially."

PRINTING IN COLOURS.

In making mixtures for colour work, when only a small quantity of each colour is required, it will be well to adopt the following plan: Get your A solution (gum 2 ozs., water 5 ozs.) and B solution (a saturated solution of potassium bichromate) in separate bottles ready to hand. The colours may be "Syntonous," or any of the water colour box variety, in tube, cake, or pan. Each tint to be applied must be decided upon before the bichromate is added, or its strong yellow colour will upset all preconceived calculations. Mix the tint with as little water as possible in a palette dish. If we use the cake colours, they must be rubbed in the dish to a thick consistency. But the tube colours will be more convenient in every way. When we have decided upon the tint, which can best be done by thinning a little of the thick colour from the palette dish with water and testing it on white paper, we take equal quantities of A and B solutions and add them to the colour in the dish, until the mixture is the proper density.

In all colour work it is well to commence with the brightest warm colours, and finish with a cold transparent one, generally a tint

in which cobalt blue plays the greater part, remembering that it is always easier to subdue a bright colour than to brighten a dull one. Every coating need not be a self-coloured one. In a landscape, for instance, we may, in the process of coating, dip from two to three solutions and blend them on one print at one operation, and we may even take a step further, and on the first print or key, roughly paint in the various colours, finally exposing to light and developing, to get form and shade. In any printing, the application of colour may be quite local, or may be removed from any part where it is not wanted by the use of a brush, blotting-paper, and clean water, in the manner described in the production of "Clover."

IX.—DESCRIPTION OF THE ILLUSTRATIONS.

“PIERETTE” is from a “single” print in black, the paper being sensitised previously to the coating of pigment and gum. The negative is somewhat hard, and therefore a long exposure was required. Development was commenced by soaking the print in warm water for some hours, after which the picture developed out well in the lights, though it remained exceedingly dense in the shadows. Spray from the tap lightened these considerably, and further reduction was made with a brush while the print was drying. This print was exhibited at the Salon in 1898.

“Anticipation” is a “single” print, the operation of coating and sensitising being done at one and the same time. The colour is Indian red with a little black added. The coating was a thick one, and the print was placed in warm water and allowed to develop mechanically. The background, however, which, it will be seen from the one illustration, is a dark one, washed away in smudges

and patches, and the effect of the whole became disappointing and hopeless, until, in a reckless mood, I picked up a brush and removed the pigment from all parts except the face, gaining thus a result which was much more satisfactory. Then, when the print was partly dry, a little spotting was done by the removal of dark specks of pigment with the point of a brush. The paper was a cartridge, and carried no special sizing. Some traces of pigment were left in the grain of the paper, and after the print was quite dry the background was scrubbed with a nailbrush where this grain became very apparent. This was in the exhibition at the Salon, 1901.

“Anticipation No. 2” is from a platino-type print taken from the same negative.

“Eventide No. 1” is a “single” print in brown ochre, deepened with a little black, the sensitiser being added to the pigmented gum. It was partly developed in warm water and finished under the tap. Salon.

“Eventide No. 2” is a “multiple” print. The first coating was of red ochre—a somewhat brilliant colour. The second coating was a very thin one of a cool brown made

THE ILLUSTRATIONS:

by a mixture of black and burnt sienna. The red of the first printing was quite neutralised by this, and a good deal of half-tone was also added. A third thin coating of the second mixture completed the print. The first printing was developed at the tap. The second and third quite mechanically by being placed face downwards in a bath of cold water.

“Darawa No. 1” is a “single” print on a sheet of notepaper presensitised. The coating of pigment and gum was a thick one. Development was commenced by soaking in warm water for a short time, but the result was not promising. The paper was somewhat absorbent, and did not part with the pigment freely. Recourse was then had to the brush, and by the removal of the background the face assumed a more pleasing appearance. The shadows of the head and hair were still thick and black, and practically without form, and I applied the brush freely, evolving a sort of Eastern head-dress, without any such intention in my mind. The pigment retained on the face suggests colour, and thus supports the Eastern idea. The reproduction fails to give any notion of the

quality of the print. Gum prints never reproduce well, the texture and grain are exaggerated, and, in fact, their chief charm is lost.

This print can scarcely belong to legitimate photography, and yet it is in the main mechanically produced. Personally I always seek the best result possible under the circumstances, and no question of legitimacy rises in my mind until exhibition time arrives. It would be a foolish proceeding indeed if one were to refrain wilfully from the production of a pleasing result, simply because, in the eyes of the purists, it is not strict photography. In competitive exhibitions it would be manifestly unfair to class such prints as photographs. But in pictorial exhibitions, where the result and not the method of producing it is the chief consideration, there can be no question of unfairness.

“Darawa No. 2” was produced by three printings. The first two coatings were of a red brown, made up of burnt umber and burnt sienna. Development was mechanical, though the somewhat unsatisfactory background was removed with a brush before the print was taken finally from the water.

THE ILLUSTRATIONS:

The third coating was a thin one of warm black (umber and black).

The background of the negative, in the usual way, would be dark. A little exposure, therefore, fixed this last layer of pigment everywhere, except on the face, which was somewhat protected by the greater density of the negative. After the print had lain in water for a short time, a soft brush easily and speedily removed all traces of the third coating from the face, leaving a picture of a rich warm brown deepening in colour in the shadows of the hair, on a cool, grey ground.

“The Watcher” is a “multiple” print of three printings. The negative was taken in the North of Ireland in an Irish cabin at Magilligan. The light inside was poor and of a peculiar greenish hue, derived from the crown glass bullions through which it passed. In making this print I sought to reproduce something of this effect, and have, to some extent, succeeded in my aim.

The first print was a warm brown of burnt umber, not very strong, but exhibiting a fair amount of detail. This was much too warm in colour, and gave no idea of the

cabin as I saw it. The next coating was, therefore, from a mixture of black with a little burnt sienna, which, on being applied, produced a general greyness, with the warm depth of the previous coating showing transparently in the shadows.

The result, though good, was still lacking in completeness, and in the palette dish of a water-colour box I mixed a green tint, with cobalt blue and Indian yellow moist colours, adding to the mixture equal parts of gum solution and potassium bichromate. With this mixture I gave the print a final coating, afterwards exposing and developing, with satisfactory results. The green pigments in the high lights in the bull's-eyes in the windows and on the profile of the old woman, where the negative was densest, partly washed away, leaving a suspicion of colour only. In the other parts of the picture it was in inverse proportion retained, and gave a peculiarly luminous atmospheric effect, such as probably could not be obtained by any other photographic process. A picture practically in monochrome, but with a differentiation of colour tones that added much to its pictorial qualities.

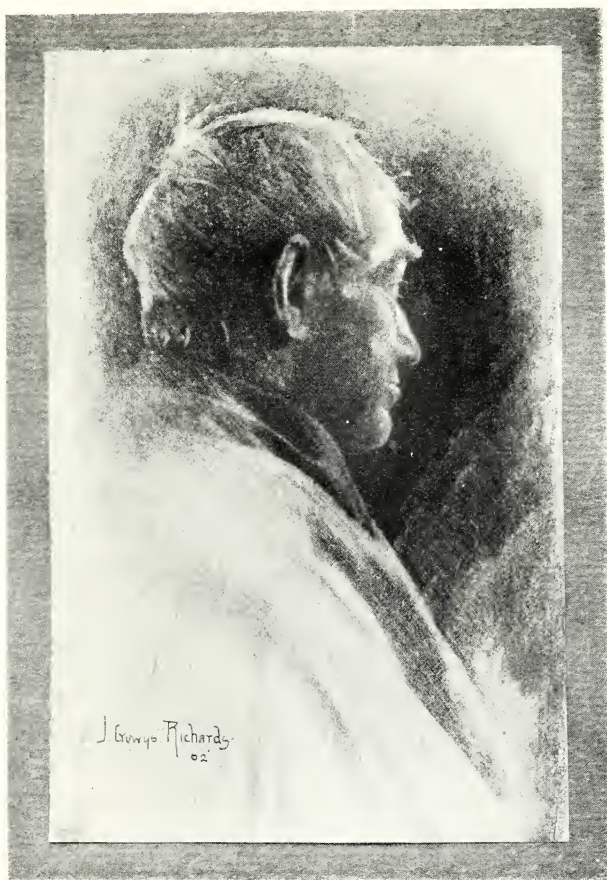
THE ILLUSTRATIONS.

Unfortunately in the illustration nothing of this effect can be reproduced. Readers must experiment on these lines for themselves before they can fully realise the possibilities.

Development was in the main mechanical during the three operations; but in the second a brush was passed lightly over the face of the old woman, thus removing a portion of the grey tone and showing more of the warm brown of the first printing.

"Beatrice No. 1" is a "single" print in a warm black on unsized cartridge paper. The pigment (dry powder), gum, and bi-chromate were applied at one operation. Development commenced in the usual way, and was then continued under the tap. The paper did not part with all its pigment, but retained a fine layer everywhere, which, however, gave way readily to the brush. It was subsequently removed entirely from the background, the profile being carefully followed with a fine sable pencil whilst the print was still wet. After it had dried a little a few dark spots were removed from the face.

"Beatrice No. 2" is a "multiple" print in four printings of light red, each mechanically developed in cold water.



PROFILE NO. 5.

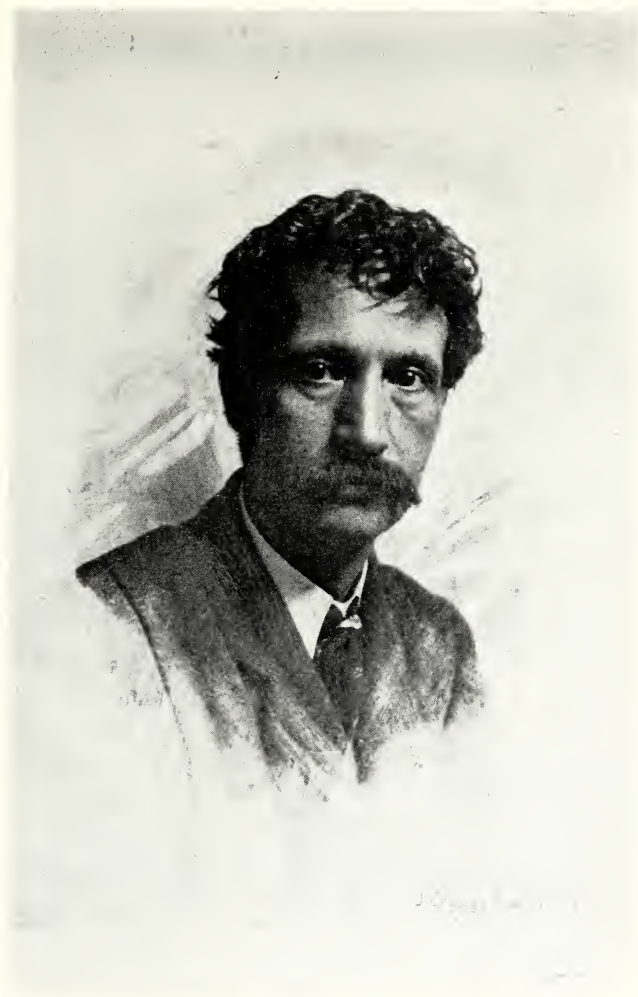


A SINGLE PRINT.

Plate No. 27.



A SINGLE PRINT.



PRINT IN TWO COLOURS.



"ELEANORE."



HEAD STUDY.

“Head No. 1” is a “single” print, and the gum, pigment, and bichromate were applied at one operation. Reeves’s No. 3 Continuous Cartridge Paper was used, and pigments in dry powder. The colour was a warm black—a mixture of vegetable black ten grains, and burnt sienna fifteen grains, added to gum half an ounce, bichromate solution half an ounce. Development was commenced by the preliminary soaking in cold water, which, in this case, occupied two hours. It was then further treated under the flow of water from the tap. The coating was a strong one, and the pigment stood up thickly in relief, so thickly that the slightest touch made an ineffaceable smear. The print was set at an angle for the water to drain off it in the usual way; and then a flat hog-hair brush was brought into play, and with it the still soft pigment of the background, which still retained its softness, was dragged about and distributed evenly, the brush being wiped on a towel occasionally so as to keep its tip dry.

“Head No. 2” is a “multiple” print of four printings of burnt umber.

“Group of Boys” is a “single” print on

THE ILLUSTRATIONS.

a sheet of notepaper. The sensitising and coating were done at one operation. The colour is a warm brown composed of ivory black and a little red ochre, the pigments being used dry. The development was entirely mechanical.

“The Abbot” is a “multiple” print in two printings. The final coating was a dark brown, laid on thickly, and developed mechanically. The second coating was of black, laid on thinly, and developed mechanically. The original gum print from which this illustration was made has a deep rich colour, the final coating of black giving depth and strength to the shadows, whilst the half-tones and high-lights retain the original warm brown of the first printing.

“The Kitten.” This is a “multiple” print of three printings, made on a Winsor and Newton’s Whatman board trebly sized. Each coating was a thin one of burnt umber, and development was mechanical throughout. The original is a soft print, which has not reproduced well.

“The Pierrot” is a “single” print on a half-sheet of notepaper not specially sized. The pigment used was a coarse ochre, roughly

ground, and was added to the bichromate and gum. The coating was a thick one, and the exposure lengthy. Development was commenced by a preliminary soaking in warm water, and when the modelling of the face was becoming apparent, the print was lifted out of the bath and laid flat on a piece of glass. Further development was continued under the tap, from which the water was allowed to flow in a gentle stream. When the picture was well advanced, the glass was lowered to a depth of seven or eight inches from the water tap. The water then falling with greater force removed the pigment quickly from both the background and the lower part of the drapery. At this stage the print, still adhering to the glass, was inclined against a wall and allowed to dry partially, when the pigment of the background on the lower right hand corner was further reduced with a brush, the face also being improved by the removal of certain small dark spots. The reproduction has again played the gum print false, this being in a soft brown colour, and the lights, which here appear so hard and white, are but faintly suggested in the original.

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“Profiles Nos. 1, 2, 3, 4” are stages in a “multiple” print from the same negative. “No. 1” is from the first printing, which had a coat of burnt umber. This, in the original, is a thin and weak-looking image. Development was carried out by immersing the print in cold water, face downwards, and allowing it to develop mechanically. When quite dry it was again coated with the sensitive mixture in the same manner as before. It will be remembered that for all “multiple” prints the bichromate, pigment, and gum are applied to the paper at one operation, the mixture being kept in a wide-necked bottle ready for use.

Illustration “No. 2” gives the result of the printing of the second coat of pigment. In the original this is still weak and hard, though it has gained a considerable amount of half-tone, and the depth of the shadows is still increased. Another coating of the same mixture was given, but in this case a thin one, since the main object was to overcome the harshness of the high lights. This coating, in addition to being thinly applied, contained only a small proportion of pigment. The constituents of the stock mixture

in the bottle separate when it is left undisturbed for a little time, and the pigment, being heaviest, sinks to the bottom, leaving the gum and bichromate solutions comparatively clear. As it must be shaken or stirred before use, it follows that either a strong or a weak percentage of pigment may be obtained, according to the sufficiency or insufficiency of the stirring or shaking the mixture receives.

Illustration "No. 3" shows the result after the third coating. The head is rounder and the picture has gained generally, but there are still lights that would be better subdued, and therefore a fourth coating of the thin sensitive mixture was given.

Illustration "No. 4" shows the final result of this last coating, and in the gum print it is fairly satisfactory, as the colour is rich and the gradation pleasing. This print was exhibited in the Salon of 1902.

In the four examples of this study the gradations were gradually built up from the shadows to the highest lights; but the lightest tones might have been secured in the first print, the other printing in that case being so developed that the shadows would

THE ILLUSTRATIONS.

be gradually added to. With a hard negative I generally commence printing in thin coatings of a mixture weak in pigment, which yields a soft picture that is easily strengthened by the application of a mixture containing a greater amount of pigment, when exposure should be rather under the normal, and development should be continued until the high lights have washed clear, and the required strength is left in the shadows. The number of printings a picture is to have will be decided entirely by the feeling of the artist, who will probably recoat as long as he can detect any falsity that can be remedied. It is so simple a matter to give an extra coating, taking as it does but little time, and involving no risk if only one is careful to avoid gross over-exposure.

X.—SUPPLEMENTARY.

GUM solution is in its most soluble condition when freshly made, but after standing for a week or so it becomes sour, or acid, and less soluble, though its working powers are not in any way impaired by this change, since, if it is used in a mixture made by an ordinary formula, and the paper is coated and printed with a normal exposure, the image will develop slowly, with its pigment firm and capable of standing considerable manipulation with a spray of water or a brush. As it will be difficult, however, to estimate how far this acidity of the gum has gone, and excess of acidity might cause too much insolubility in the pigment, it will be well for beginners to use a fresh gum solution each time a fresh batch of paper for the "single" printing is made. More certainty of result would thus be obtained—the conditions of working being thus rendered uniform. Increase of acidity really means a corresponding decrease in the time of exposure, as the gum is already partly insoluble before its exposure to light begins.

SUPPLEMENTARY:

A slight degree of acidity can be imparted to a freshly-made solution by the addition of two or three drops of a ten per cent. solution of citric acid. This will make the pigment firmer and easier to handle.

Generally speaking, an excess of gum in the coating, combined with a short exposure, will yield a print with coarse grain; but the same condition, combined with a long exposure and prolonged soaking in water, will give delicacy and half-tone. If, during development, the pigment breaks away in small scales, this is probably due to the exposure being insufficient for the thickness of the coating, since a thick coating ought to have an exposure very much longer than the normal. An excess of pigment will produce a deep stain in the paper.

When the print has been specially prepared for development by friction—*i.e.*, by adding two or three spots of citric acid to the mixture of potassium bichromate, gum, and pigment, or by making the sensitising mixture of ammonium bichromate and chromic acid as per formula—the following alternative method of working may be found preferable in some cases: The print, first of all, receives

a considerable amount of exposure, and is then placed in warm water face downwards. After a little soaking it is turned face upwards on a piece of glass, which is inclined at an angle by resting one of its edges on a wooden support. Small quantities of fine boxwood sawdust and fine sand are then put into the warm water, and the print is gently laved with the mixture. Or, after the preliminary soaking, when the pigment is softening, development may be continued with a tuft of soft cotton-wool. The print should in that case be laid flat on the glass with the water over it, while the tuft of wool is run very lightly over its whole surface. These methods are more particularly adapted for the "single" print, though they may also be resorted to in the "multiple" process, whenever, by inadvertence, a print has experienced a considerable amount of over-exposure.

The softest and most delicate prints are obtained by allowing them to develop in cold water.

Any excess in the proportion of the bichromate in the gum solution above five per cent. does not appear to affect the length

of exposure, or the final result, in any appreciable way. As I always dilute my stock mixture for "multiple" printing, when it has thickened, or when I want to apply a thin coat, by adding bichromate solution, its proportion to the gum becomes at times very large.

For clearing away all traces of the yellow stain left by the bichromate I advise the use of sodium bisulphite in preference to alum, which both destroys some of the finer particles of pigment and leaves a coarser grain behind. The bisulphite should be applied in a five per cent. solution.

If parts of the picture need redeveloping after the print has been thoroughly dried, soak the whole for a few minutes in a ten per cent. solution of sodium bisulphite in hot water. The pigment will then become quite soft, and may easily be removed with a brush or a tuft of cotton-wool. Pigment for spotting may be obtained by taking a piece of paper of the same batch as the print to be spotted, and giving it a slight exposure to light. It is then placed in cold water until the bichromate has dissolved out, when it can be dried, and its thick coating

of pigment be used as a supply for spotting.

Reversal of the image is caused by under-exposure. Some light action is required in every part of the pigmented surface before the maximum of solubility is secured.

Brushes should be carefully washed after being used in the sensitising mixture, or else they will be spoiled through the hardening of the gum.

If the badger softener should develop a tendency to part with its hairs, a strip of paper may be pasted round the rectangular portion of wood in which the hairs are set, letting the paper project beyond the wood a quarter of an inch or thereabouts. If the brush is now stood on its head, the paper will form, with the wood, a trough at the roots of the hairs. A little thin varnish is then taken, and sufficient of it poured into this trough to cover the roots of the hairs a quarter of an inch deep, where it is left standing for, say, ten minutes. Then the varnish is poured off, and tearing away the paper, the wood is wiped clean with a piece of rag. The brush is kept standing on its head for a day or so, until the varnish is dry, and the hairs will once more be found firmly

SUPPLEMENTARY.

fixed in their places. In washing the badger softener it should never be dipped wholly into the water, but the tips of the hairs only should be washed, using a little soap at first, but finally rinsing with clean water, and drying gently on an absorbent towel. Perfect dryness will be obtained by rolling the handle of the brush between the palms of the hands, and so imparting to it a rotary motion.

When my readers have followed me so far, they will realise that the making of a picture in gum, even under the simplest conditions, involves the exercise of much personal taste and careful thought, as well as unlimited patience. Possibly some of them will question whether the game is worth the expenditure of so much candle.

I remember being once asked, after a demonstration of the Gum Process, "What the advantages of 'multiple' gum printing were over P.O.P." To the question I replied, "If P.O.P. fulfils your requirements, the advantage lies with the P.O.P.; and I must give the same answer to anyone enquiring; for if a worker cannot infuse more personality, more poetry, and more refinement into his

work by the use of the gum process, he is, indeed, wasting his time in trying to learn its technicalities. Let him, by all means in that case, keep to those methods of printing which in his hands have already proved most helpful.

Gum is not the best process for everyone to use, nor yet is it the best for every purpose. There are so many printing processes that great width of choice is open to suit idiosyncrasies. The gum process, with its possibility of control and extreme docility of working, must appeal more particularly to those workers who have found, even in the best of other processes, constraint and an absence of that mastery over results which seems indispensable to any perfectly truthful interpretation of nature.

To workers who, whilst endowed with the instincts and enthusiasm of the trained artist, lack the technical skill that would enable them to make efficient use of the pencil or brush, the gum process appeals as yielding the *ne plus ultra* of artistic expression by mechanical means. I believe that photography is potentially fine art, and that to doubt this is a proof of blind or wilful prejudice.

SUPPLEMENTARY.

I would not claim for it a place in the highest ranks of art, since, at its best, the camera, as an interpreter of the beautiful, falls immeasurably below that complex instrument—a responsive human hand working in unison with an imaginative and poetic mind ; but I do claim for photography that, in the future, if it is aided by this sympathetic process, it can, and must, rise to greater heights than those yet reached, and than could ever have been possible with a purely chemical and arbitrary medium.

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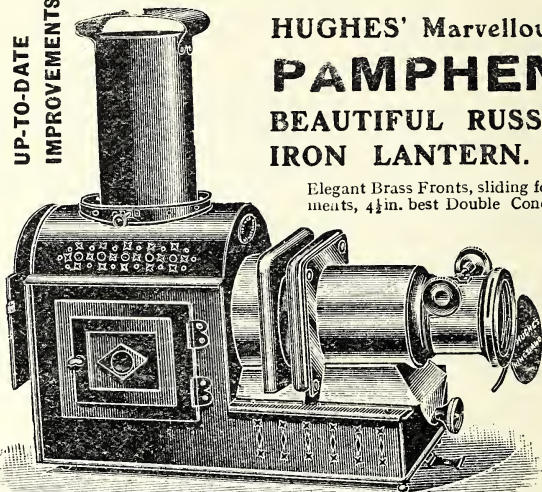
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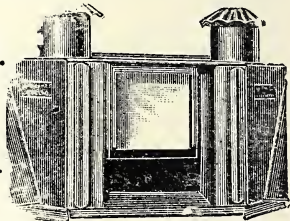
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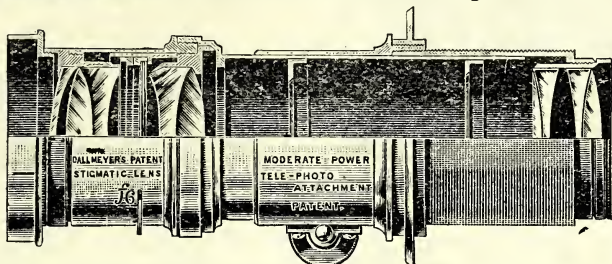
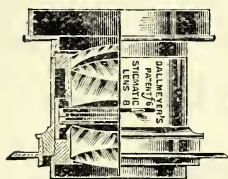
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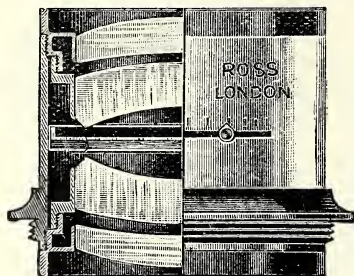
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